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HENRY V. POOR, Editor.

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PRINCIPAL CONTENTS.

AMERICAN RAILROAD JOURNAL.

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Saturday, August 4, 1849.

Iron Ores and the Iron Manufacture of the United States.

CONNECTICUT.

Continued from page 467.

Sand Plain Furnace—Stuart & Hopson's. This furnace has been lately rebuilt, supplied with hot blast pipes, and run with good success. It is situated on the Housatonic river near the railroad. It makes use of the Kent ore, some from the American ore bed, twelve miles distant, and has been supplied with some from Stockbridge, Mass., 48 miles by railroad. The average cost of the ore is about $3 per ton, delivered. The Amenia ore costs $3 25; charcoal costs about $6. It makes more iron than the average yield of the Connecticut furnaces, in part from using hot blast, and in part from being skilfully run; and for the same reasons its consumption of coal is less than the average. The yield of the furnace is four and a half to five tons per day for eight months in the year; and the consumption of coal is estimated at 130 bushels.

Macedonia Furnace.—This is a small furnace, twenty-four feet high, built about 17 years since.—It has lately been altered to hot blast. It uses ore from the Amenia bed at an expense of $3 25 per ton and the Kent ore, which costs—for duty in the mine 50 cents; mining one dollar; and transportation one dollar - $2 50; coal is from $6 to $6 50 per hundred bushels.

Bulls Bridge Furnace.—This was built two years after the Macedonian Furnace, but has been idle many years until lately. It is situated on the Housatonic two miles from the railroad. Its blast is partially heated only. It uses ore from Quaker Hill mine, New York, which is seven miles distant, The cost of the ore is about $2 52; charcoal from $6 to $8. An experiment has lately been tried at this furnace to substitute anthracite for charcoal.—The disproportioned rates of transportation to and from the seaboard, which these lower furnaces are compelled to pay, operate greatly to their disadvantage, and to check further development of the mineral resources of the country. Companies making iron in Berkshire County, Mass., can actually ship it to New York for one dollar less per ton than is charged to these lower furnaces, which are from 50 to 60 miles nearer. The explanation is, that the Massachusetts companies have a choice of rates either to Hudson or to Boston, and therefore the Housatonic road must charge them low rates, or lose their business.

Waramaugh Furnace.—This is in Washington near the line of New Milford, six or eight miles east of Kent or seven from the railroad. This furnace was rebuilt in 1846 and supplied with a complete set of hot air pipes and other modern improvements. It is situated on a good water power, the outlet of a pond some three miles long. At the head of the pond are some magnetic ore veins, which however, have not proved of importance either for the quantity or quality of the ore.

The Kent ore bed is seven miles distant. The furnace pays $1 75 for the ore at the bed, raised, and $1 25 transportation. They have a perpetual lease of the Fuller ore bed, 4½ miles off, and pay for this ore a duty of half a dollar. The ore from this mine is considered of good character. It is used to some extent by the forges. There appears to be however, difficulties attending the mining of it in consequence of its low position. Another bed not much known is owned by this company only half a mile from the furnace. A great portion of their ore comes from Quaker Hill, New York, about 14 miles; and they have also purchased several tons of the Stockbridge ore of Mass. The average expense of the ore at the furnace is not far from $4. Woodland is perhaps more abundant in the vicinity of this furnace than of any other in Connecticut. Contracts for charcoal are made at $5 75 and $5 87 per hundred bushels. The furnace is 8 feet across the boshes, and 38 feet high, and is capable of making 5 tons of iron per day.

Veins of Spathic Iron in New Milford and Roxbury.—These veins occur about seven miles from the Washington Furnace, crossing the line of the two towns above named half a mile southwest from the Shepaug river. I have seen the two veins represented in the figure. Prof. Shepard speaks of a third, which I have not seen.*

The southern one of the veins is met with by the road side about 3½ miles from the railroad or elevated land in ledges of a granitic character. The rock appears to be regularly stratified, dipping about 25° to the northeast. The vein here, as seen on the surface, is composed of quartz and the spathose proto-carbonate of iron mixed together. It is a similar ore to the white carbonate described as occurring with the hematites at the West Stockbridge ore bed, containing, when free from foreign matter, about 40 per cent. of iron, and 36 of carbonic acid, the remainder being oxygen, magnesia, lime and manganese, the three last in small proportions. After roasting, the percentage is much increased by the loss of the carbonic acid. At this locality the ore is found in a true rock vein associated with quartz, the whole thickness of the vein at the surface being three feet. Its position is vertical, and its course at right angles to the stratification of the granite in which it lies. This vein, I think, may be traced in the NW. and SE. direction near the road for more than a mile. It has not been worked.

The other vein, about half a mile farther to the NE., resembles the former and may be traced equally far. It has been worked to considerable extent by different companies, the first operations being commenced a hundred years ago. The object was silver, and large sums of money have been expended in sinking shafts and running adits in the expectation of opening a rich silver mine. I found the old workings filled with water, so that I could get no view of the mine. Professor Shepard speaks of

* Report on the Geological Survey of Connecticut, p. 31; also Silliman's Jour. vol xix.

Table of the Hematite Furnaces of Massachusetts, Connecticut and New York.

Number.	Furnaces.	Situation.	Distance to Railroad.	Blast.	Ore hauled. Miles.	Cost of 2½ tons of ore.	Cost* of coal to ton of iron.	Cost of ore and coal to ton of iron.	Remarks.
1	North Adams,		on railroad,	hot,	2½,6,15&22	$7 00	$8 25	$15 25	Transportation of iron to Boston $4, to Troy $3.
1	Cheshire,		on railroad,		½ m. & 1 m.	3 50	7 50	11 00	" " " "
1	Lanesboro,	Berkshire county,	railroad 1½ m.	hot,	3½ & 4½	4 66	7 50	12 16	" " " 4 50 " 3 50.
1	Richmond,		railroad 1 m.	hot,	1½	4 66	11 25	15 91	" " " 4 " 3 ore duty 37½ cents, costs $2 per ton.
1	Lenox,		on railroad, R.R. 5½ mls.	hot,	7½	6 46	10 50	16 96	" " " 4 " 4 ore duty 37½ cents, hauling $1 40.
2	Stockbridge,	Mass,	on railroad.	hot or 1 cold,	7	4 33	10 50	14 83	Company owns the ore beds. Transportation to Boston $4. Troy 3. New York 2 50.
1	Van Deusenville,		railroad ¼ m.	hot.	8	5 83	9 37	15 20	Transportation to Boston $4 50, Troy 3, N. York 2 50.
1	Chapinville,	Salisbury, Conn.	to railroad $1,	cold,	7	9 33	14 00	23 33	
1	Joyce's	" "	" "	cold,	7	9 33	14 00	23 33	
1	Mt. Riga,	" "	" "	cold,	4	8 96	12 00	20 96	
1	Limerock,	" "	" "	cold,	5	9 33	13 00	22 33	Transportation to New York $3. All these furnaces principally supplied from the Salisbury ore bed, and pay the extraordinary duty, or ore-leave, of $1 25 per ton of ore.
1	Adams,	N. Canaan, "		cold,	11	11 08	12 00	23 08	
1	Beckley's,	" "		hot,	11	11 08	9 00	20 08	
1	Church & Scovilles,	S. Canaan, "	railroad 3 mls.	cold,	11	11 08	12 00	23 08	
1	Hunt, Lyman & Co.	" "	railroad 5½ m.	hot,	10½	11 08	9 00	20 08	
1	Cornwall Iron Co.	Cornwall "	railroad ¼ m.	cold,	10½ & 12	11 08	11 00	22 08	
1	Cornwall Bridge,	" "	railroad ½ m.	cold,	14 & 40	7 00	11 00	18 00	Owned by C. C. Alger, Esq., of Stockbridge, ore sent from West Stockbridge, Mass.
1	Sharon Valley,	Sharon, "		hot,	3 & 10	5 25	11 25	16 50	Uses ore from Amenia and Indian Pond ore bed.
1	Weeds,	" "		cold,	"	5 83	14 00	19 83	
1	Sand Plain, Stuart & Hopson,	Kent, "	near railroad.	hot,	12 & near.	7 58	9 00	16 58	Uses some ore from W. Stockbridge, 48 m.
1	Macadonia,	" "		hot,	10	aver 6 70	9 75	16 45	
1	Bulls Bridge,	" "	railroad 2 m.	hot,	7	5 83	10 50	16 33	About using anthracite.
1	Waramaugh,	Washington, Conn.	railroad 7 m.	hot,	4½ & 14	9 33	8 62	17 95	
1	Capake,	Columbia Co., N.Y.	to railroad $1,	cold,	0	2 92	14 00	16 92	
1	Northeast,	Dutchess Co. "	railroad 7 m.	hot or cold,	0	3 50	10 50	14 00	
1	Amenia,	" "	Housa onic R. 7 miles, near Harlem R. R.	hot,	0	3 50	9 75	13 25	
1	Dover,	" "	Har. RR. near	hot,	5 & 10	5 83	10 50	16 33	
1	Whites,	" "	" "	hot,	2 & 10	5 83	10 50	16 33	
1	Beekman,	" "	13 m. to Hudson river and railroad.	hot,	2	4 08	12 00	16 08	
1	Fishkill,	" "	13 m. to Hudson R. & RR.	hot,	2	4 08	11 25	15 33	
1	Poughkeepsie,	" "	on Hudson river and R.R.	hot,	14	6 41	† 7 00	13 41	This furnace is now supplied in part with magnetic ores from the other side the Hudson, at a less cost than that of the hematite.

* This is estimated at 150 bushels to the furnaces using the hot blast, and 200 to those blowing cold. † Anthracite.

the vein as being from six to eight feet in width.—What appears to be a continuation of this vein, seen on the surface some rods to the southeast, is there not more than two feet thick. At the old mine around the shaft, which is said to be 175 feet deep, are heaps of the sulphurets of iron, copper lead and zinc.

Could any large quantity of the pure ore be obtained free from the quartz gangue and these other matters, there is no doubt it would be a very valuable ore to mix with the hematites—but we have no satisfactory evidence of the thickness of the ore in the vein, over which, as Prof. Shepard remarks, the white quartz frequently preponderates. I found some lumps of ore containing large seams of sulphuret of iron; if these should prove frequent they would much impair its value. At any rate, it will require careful sorting; and though well situated on elevated ground for mining without serious trouble from water, the expenses of following a vein of this kind in rock can hardly be repaid by a material, which, at the most, is worth on the surface only about $2 50 per ton weight of some ten or twelve cubic feet.

Prof. Shepard gives an interesting history of the mines, to which I would refer for further particulars; he also describes the process of converting this variety of ore into steel in Germany, for which purpose it is there very extensively used. The best steel, however, is made from the magnetic ores, and the excellent varieties of these we have in this country, so well adapted to the manufacture of the best steel, remain strangely neglected.

The sixteen furnaces above described are all situated in Litchfield county. They average each one from 700 to 800 tons of iron per annum, or about 12,000 tons in all. Making iron generally of excellent quality, the manufacturers seem to have been contented with this advantage, and have failed

to keep pace with the improvements which have so greatly increased the yield at the furnaces in Massachusetts and other states. The expenses of the business are greater, too, in this state, principally from the high price of the ore, and in part from the largely continued consumption of fuel. Few of the hot blast furnaces make their iron at an expense less than twenty-five dollars, and to the cold blast furnaces this rarely falls short of thirty dollars delivered on the railroad. When to this is added the cost of transportation to market, it is apparent that the price of the material must fall, or the furnaces stop in times when Scotch pig can be delivered in New York and Boston at 20 to $22 per ton; even allowing a demand to considerable extent for the superior quality of iron these furnaces make for forge purposes, at an advance of five to seven dollars over the price of Scotch pig.

Besides these furnaces, which use hematite ores only, there are in the centre of the state others maintained by the bog ores found in their vicinity. One of these in operation is at Hebron; and another, whether now in operation or not I do not know, at Stafford, near the Massachusetts line. These furnaces are of small size, each makes only between three and four hundred tons of pig iron, and this of inferior quality, suitable only for foundry iron. It is run into castings, which are sold in the country around. The bog ore is found in the neighborhood of the gneiss rocks containg pyrites, from the decomposition of which it seems to be derived. The localities of the ore are scattered and no very large amount is found in one place.

The table below presents a list of the furnaces which make use of the hematite ores in this state and in Massachusetts. Those of the same class in the adjoining counties in New York are also added, all belonging in fact to the same district.—Data of the cost of manufacture are given in a condensed form, which exhibit at a glance the relative natural advantages of the different establishments. For this table it was necessary to assume a uniform consumption of fuel and ore for all the furnaces of the same character of blast; though by differences of care and skill, or of materials or machinery, some run with greater or less economy than appears in the table.

Copper Ores of Lake Superior.

Continued from page 468.

LAKE SUPERIOR COMPANY.

By entering the field among the first, this company secured several leases of locations on what was then regarded as the choicest part of Keewena Point. Some they disposed of to other companies, but retained one next east of the Pittsburg and Boston company, lying on the lower part of the brook called Eagle river. The trap rock approaches here nearly to the lake, and is exposed up the course of the stream and of its branches for nearly ten miles inland. By its rapid fall the ledges are often uncovered, and in many places particles of copper are seen in the crevices of the rock, and sometimes what appear to be veins containing lumps of this metal of considerable size. At a point a mile and a half up the stream the indications seemed sufficiently encouraging to warrant the establishment of a mining settlement. Shafts were commenced in the hard amygdaloidal trap by the side of the brook, where native copper with some silver was found disseminated in the form of a "*stocwerk.*" This metalliferous portion of the rock seemed to follow a regular course like a vein, and this was the usual course of the veins of the country. Encouraged by this, the great extent of this belt, and the belief that the silver and copper were in sufficient quantity to warrant large outlays, the company built a mill for crushing and washing the ore, and laid out their mining operations on an extensive scale. The rock was found extremely hard and expensive to mine, and no less so to crush after it was quarried. The cast iron stamps, made of inferior quality of iron, were rapidly worn out, and the ore proved much less rich than was expected. Iron mills of different kinds were tried, but they all proved of no service. Strangely enough no attempts were made to roast the ore previously to crushing it, though some experiments tried on a small scale proved the efficacy of the method; and smelting was an operation that had not then been attempted in the country.—Still, the explorations of the mine were vigorously prosecuted: one shaft was carried down nearly 100 feet, and levels were run off in directions, reaching far more productive spots. One of these passing under the stream, close by, entered into what the workmen called an "*opening.*" The trap rock suddenly terminated in a vertical wall, and against this lay piled a great collection of loose materials—bowlders of trap rock and sandstand, and irregular shaped pieces of copper, all more or less worn by the action of the water. These materials were packed so closely together that they were like conglomerate rock and could be removed only by blasting.—Little water could penetrate them, except on working up near to the bed of the brook, it came down like rain. Following this collection down, it was found to reach to the depth of forty feet, and in another place to over sixty feet below the bed of the stream; and under it lays a true well defined vein, composed of quartz, calcareous spar and laumonite, containing a small portion of copper and siler. The deposit above it yielded in many places large quantities of metallic copper. One of the head miners informed me he alone took out in one day from one small spot 3600 lbs. The pieces varied in size from small particles to masses of several hundred pounds weight; one piece weighed even 1600 lbs. These were found closely packed together at the bottom of the deposit on the surface of the vein, the smaller pieces at the bottom, the largest above. Bowlders of trap, well rounded, filled the remainder of the opening. Particles of silver also were met with, one pure lump weighing 6 lbs., and 10 ounces.—This deposit was drifted on for 108 feet in length; but though a considerable quantity of copper was taken from it, no more such pockets were found as that described—still enough was procured to pay for the work done in it.

The extent of this collection of loose materials is not yet ascertained: its width in some places seems to be merely that of the vein, being shut in on each side by walls of trap; but for the most part it is of much greater width, spreading out on the east side of the stream over a considerable area, and even rising into a hill full sixty feet above the present bed of the brook. In this hill the conglomerate collection abuts against a vertical wall of trap, which is probably the wall of the same vein. A level has been driven on the line of contact of the two rocks, without however finding it. It is only beneath the present bed of the stream, and over the line of the vein, that this collection was found productive in copper; explorations, therefore, are not likely to be carried on in other parts of it.

The period of the collection of these materials is evidently very remote, and the manner of it somewhat obscure. From the height of not less than 60 ft. above the present bed of the river to the depth of the same number of feet below it, a powerful action must have been at work during long periods of time wearing through this very solid rock, and filling the depressions with the broken fragments, which were smothered and rounded by the incessant movement of the water and stones. The immense quantity of rounded bowlders collected together seems to show that the river above has been capable of producing these effects; though from the vein being cut out so nicely, and the fact of ancient stone hammers being found on this locality, one might be inclined to refer them in part to human agency; particularly as the ruins of extraordinary mining operations, conducted by an unknown race of people, are found in other parts of this region, together with great quantities of these singular hammers, which appear to have been their principal tools. But these operations, so vast and wonderful, can only be explained by the action of the river running over rapids and carrying masses of ice and stone, sometimes wearing out and sometimes filling its bed, and confined through long periods of time by the looser character of the vein itself within its narrow line.

The thickness of the vein below this collection varies from one to four or five feet. The composition is similar to the other productive copper veins of the country; but though it seems certain that this was the original repository of the loose masses of copper found on its surface, the workings upon it, though extending to the depth of 156 feet, and horizontally still farther, have not been so fortunate as to strike any rich portions. On the contrary they have been for the most part in barren veinstone containing a mica scattering of copper.—Its position is nearly vertical, and its course N. 26° W., S. 26° E.

In consequence of the ill success attending the work it has been abandoned for the last two years after the expenditure of a large capital. We understand, however, that the company is reorganised under the name of the "Phœnix Mining Company," and that the work is to be resumed. A portion of the tract is purchased of the Government, and several localities are known upon it, which present a considerable show of copper. Should this be found in veins, as well as dispersed in the amygdaloid, the enterprise may yet be successful, as indeed the farther exploration of the vein in the brook may ultimately prove. It is of no little interest to determine the character of these indications; for there are some points, which may hereafter be referred to more fully, in which this locality differs from all the other productive mines of this region; and a successful result would show them to be unimportant for this, as well as for some other tracts similarly situated.

Copper Falls.—This is the next location east of that just described, and was set off by the Lake Superior company to the new association formed in Boston under the name of the "*Copper Falls Company.*" The mines are in the face of the high ridge fronting the lake and one to two miles back from it. Ledges of conglomerate extend from the lake up the slope of the ridge, their dip being towards the lake at an angle of 22°; alternating with them at the northern slope of the ridge are layers of trap and amygdaloid in conformable position. The lowest layers of sandstone and conglomerate crop out on the slope of the ridge, the main portion of this being occupied by trap rocks. The veins cross these layers of rock, their course being from the ridge straight towards the lake. The principal one opened is in a deep ravine, which crosses these alternations of rock; its course, as usual, that of the

vein is N. 29° W. The workings are for the most part in a band of trap (in alternating layers of compact and amygdaloidal,) the thickness of which is 163 feet. Stretching up its side is a layer of sandstone, which is the uppermost stratum of the mine; and beneath the trap is another stratum of sandstone 66 feet thick. Below this is trap again, into which the worknigs hardly extend at all. Including a winze sunk on the vein 66 feet deep, no less than five shafts have been carried down along its course. The lowest one, 47 ft. deep, is principally in sandstone; the second is 130 ft. deep; the third 43 ft.; and the fourth 166 feet. These are connected by levels, the largest line of which is 458 feet, to which should be added 50 ft. more of curve at the mouth of the adit. A considerable portion of the lode has been removed by stoping; and it has furnished, a large amount of stamp work, which now lies on the surface, 120,589 lbs. of masses of barrel ore, which have been shipped since July 1846, the yield of which was between 60 and 70 per cent. of copper. The aggregate amount of expenses has been about 55,000 dollars, while the returns have been only about 15,000 dollars.

The cause of the ill success of the mine appears to be the want of sufficient extent of the metalliferous rock; which is the amygdaloidal trap. Even in the compact trap, which alternates in successive layers with this, the vein is pinched and poor; but passing into the amygdaloid, it spreads out to a thickness of from two to three feet, and presents a favorable show of good looking veinstones, such as calcareous spar and quartz with interposed crystals of reddish colored feeldspar and of copper; some silver is occasionally found with the copper. Fragments of the wall-rocks help to make up the vein, as well as large masses and sheets of copper; and the walls at the side are penetrated more or less with the metalliferous contents of the lode. From the promising appearance of the vein, it will certainly be an object at some time to prove it in the great body of trap below, which has now been hardly reached; but this may be done as well higher up the ridge, where it comes up to the surface, as at the bottom of the present workings. At present, however, this work is abandoned, and attention is directed to some of the other veins on the tract, of which no less than twelve have been discovered. The force retained is now employed in proving one of these at a higher elevation on the ridge, where the only rock exposed is amygdaloidal trap. A general interest is felt for the success of this company, whose operations have from the beginning been conducted with system, and with one exception (very soon corrected however,) with excellent judgment and prudence. H.

United States Mint.

The following is the tariff of charges for coinage, at the United States mint.

Rate of charges upon deposits of gold and silver bullion at the Mint in Philadelphia, and the branch Mint in New Orleans, to take effect on and after the 1st July, 1849:—

I. "For refining, when the bullion is below standard." 1. On Gold—Three cents per ounce of gross weight after melting, on so much of a deposit as will bring the whole up to standard.

2. On silver—From 500 to 700 fine, 3 cents per ounce, as above.
   From 701 to 800 fine, 2½ cents per oz., as above.
   From 801 to 899 fine, 2 " " "
   On so much as will bring the whole up to standard.

. "For toughening, when metals are contained in which render it unfit for coinage.

1. On gold—From one to three and a half cents per ounce of gross weight after melting, according to the condition of the metal.
2. On silver—If not copper, one third to one cent per ounce as above.
   If copper, 500 to 700 fine, 3 cents per ounce as above.
   If copper, 401 to 800 fine, 2½ " "
   " 801 to 250 fine, 2 " "

III. 'For copper used for alloy.' two cents per ounce.

IV. 'For silver, introduced into the alloy of gold,' one hundred and twenty-nine cents per ounce.

V. 'For separating the gold and silver, when these metals exist together in the bullion.'

1. If not coppery—Proportion of gold 1 to 200 thousands, 1½ cents per ounce gross, after melting.
   Proportion of gold 201 to 600 thousand, 2 cents per ounce gross, after melting.
   Proportion of gold 601 to 900 thousant, 3 cents per ounce gross, after melting.
   Proportion of gold 901 to 935 thousand, 4 cents per ounce gross, after melting.
2. If coppery—proportion of silver 500 to 700 fine, the gold in proportion not less than 1½ thousandsths, 3 cents per ounce gross, after melting.
   Proportion of silver 901 to 800 fine, 2½ cents per ounce gross after melting.
   Proportion of silver 810 to 295 fine, 2 cents per ounce gross, after melting.
3. Limit to the separation of gold and silver—Neither gold nor silver shall be separated for the benefit of the depositor, when the net prodnct of the operation, estimated upon the above charges, shall be less than fiive dollars.

The annexed statement exhibits the coinage of the Mint in Philadelphia, for the first six months of 1849:—

United States Mint—Coinage from January 1st to June 30th, 1849.

Gold coined 1st and 2nd quarters, 1849	$2,375,389 00
Silver " " " " "	598,590 00
Copper " " " " "	25,085 89
Six months total coinage	$2,999,774 89

BULLION IN MINT.

June 30, 1849—Government deposit	$521,115 30
June 30, 1849—Individual deposit	807,972 57
Total	$1,329,087 87
Gold dollars to June 30	$362,539 00
Gold dollars from June 30 to July 18	65,000 90
Total	$427,539 00
California gold, up to June 30	$1,137,000 00
California gold, up to July 21, about	100,000 00
Total	$1,237,000 00

Manufactures at the South.

The following from the "Mississippian" shows how the people in the south are beginning to reason upon the matter of manufacturing:

"*Actual Expenses of a Cotton Factory in Mississippi, Capital* $30,000.

After an elaborate article which we gave in our paper of the 3d inst., on the subject of cotton manufactories, we do not think there is any necessity at present for further comment. We have not yet, however, furnished our readers with the very important information of the expenses of a cotton factory. We are now enabled to do this satisfactorily. The following estimate furnished by H. Hilzheim, Esq., a merchant of our city, who has given the subject more than ordinary attention may be relied upon:

9 Men, 75 cents per day		$6 75
26 Boys 40 " "		8 00
26 Girls, 50 " "		13 00
1 Spinner		2 00
1 Weaver		2 00
1 Superintendent,		3 75
1 Fireman,		1 00
1 Watchman,		75
4 Cords of Wood, $1 75 per cord,		7 00
1½ Gallons of oil, $1 25 per gallon		1 87
Incidental Expenses,		1 00
Two men for different work, $1 50,		3 00
1155 lbs. cotton, 6 cents,		67 30
300 lbs. Wool, 18 cents,		54 00
Loss in wasted,		8 00
Interest on $300,00, 8 per cent.,		6 67
Insurance on $30,000, 2 per cent.,		1 67
Board for 45 hands, Negroes, 20 cents,		9 00
" 7 " Whites, 30 "		2 10
		$200 86
2161 yards 4-4 Osnaburgs, 9 cts.,	$194 40	
300 " 4-4 Linseys, 25 cents,	75 00	
		$269 40
Net profit per day,		68 51
313 working days at a cost of $200 86 per day		62,869 18
676,080 yards Osnaburgs, p. y'r. at 9 cents,	$70,847 20	
30,000 yd's. Linseys per year, at 25 cents,	23,475 00	
		74,322 20
Net profit per year,		$21,453 02

By this estimate the net profit upon the capital invested would be about *sixty-five per cent.* We must take into consideration also the additional advantage to the town of the expenditure of the operatives. The whole amount of the sum for expenses in the above estimate will be spent in the city of Jackson."

The above is but an index of feeling which is becoming prevalent throughout the whole south; and it is rapidly commencing the manufacture of the most important articles that enter into domestic consumption. Correct views as to the importance of encouraoing a variety of industrial pursuits are rapidly pervading the whole community; and we have no doubt that in a very few years, the warmest advocates of protection will be found in the slaveholding states.

Retardation of Pulleys. Friction of Axles, and Rigidity of Ropes.

Friction varies directly as the pressure; or in other words, if the friction for a certain weight be f, the friction resulting from twice that weight is as $2f$. Friction being a constant force at every point, the amount of friction for any space is the friction for one point multiplied by the number of points constituting the space. The coefficient of friction, or the friction for a unit of weight, is different for different bodies. If therefore we call the coefficient of friction f, the weight on an axle W, and the space described by any point on the axle during one revolution 2 x 3 1416 times the radius of the axle, the mechanical effect lost by friction during that revolution may be expressed by

$$f.\,W.\,2 \times 3{\cdot}1416 = f.\,W \times 6{\cdot}2832.$$

Friction varies with the materials and the pressure employed. If W be the pressure on an axle, the friction corresponding to that pressure may therefore be expressed generally by the equation $F = f.\,W$, where F is the friction arising at the axle from the pressure W, and where f, different for different materials, is the coefficient of friction or the friction for a unit of pressure. If the space described by any point on an axle during one revolution be 2 x 3·1416 times the radius of the axle, the mechanical effect lost passing through that space, or during one revolution, may be expressed by

$$f.\,W\,2 \times 3{\cdot}1416\,r \text{ or } f.\,W \times 6{\cdot}2832\,v.$$

The motive power absorbed by friction is therefore directly proportional to the radius of the axle and the number of revolutions, seeing that the above measure is a constant quantity for each revolution, and hence it may be observed passingly the loss of power arising in revolving machinery by employing axles larger than necessary for strength, and wheels of radius smaller than required by the conditions of the machine. But the force

$$f\,W \times 6{\cdot}2832\, r$$

acts at the circumference of the axle, and when transferred to the circumference of the roller will therefore become

$$\frac{f\,W \times 6{\cdot}2832\, v}{R}$$

where R is the radius of the roller and the other quantities of the same value as before. M. Morin gives the following values for f as found by experiment for the several conditions stated:

Coefficients of Axle Friction.

Bodies in contact.	Dry but a little greasy.	Oil, tallow or lard. Applied continuously.	Applied in the usual way.
Wrought iron upon bell metal	0·251	0·054	0·075
Cast iron upon bell metal	0·194	0·054	0·075
Wrought iron upon cast iron		0·054	0·075
Cast iron upon cast iron		0·054	0·075
Wrought iron upon lignum vitæ	0·188		0·125
Cast iron upon lignum vitæ	0.185	0·092	0·100

By substituting in the equation

$$F_{,}=\frac{f\,W\times 6{\cdot}2832\, r}{R}$$

the value of f, given in the above table under the heading corresponding to the conditions of any particular case, the mechanical effect expended in overcoming F, the axle friction at the edge of a roller may be calculated.

Friction is the force necessary to overcome or break the asperities of two surfaces in contact: unguents have the effect of diminishing this force by entering into the hollows of the opposing surfaces: the amount of diminution being different for different unguents. Though the above table may furnish results sufficiently close to the truth, it can hardly be considered sufficiently accurate to regulate the choice of metals where friction is considerable, as in the gudgeon and journal of heavy water wheels, etc. The following table of the mean results of experiments by Mr. Babbage gives the best means of approximating to the different qualities of metals as surfaces in contact.

The Friction of Metal on Metal.

Bodies.	Area of rubbing surface	Mean of weights to be moved.	Mean of weights required to move them.	Mean proportion.	Weights to 1 inch area.
		lbs.			lbs. ozs.
Brass on wr'ght iron	5·90	69·55	9·510	7·312	11 12·4
Cast iron on caat iron	6·75	54·25	8·538	6·475	8 0·5
Soft steel on wrought iron	5·90	69·55	13·264	5·198	11 12·4
Brass on steel	5·90	69 55	10·584	6·592	11 12·5
Brass on brass	5·90	69·55	13·041	5·764	11 12·5
Cast iron on wrought iron	5·90	69·55	12·697	6·023	11 12·5
Cast iron on soft steel	5·90	69·55	11·139	6·393	11 12·5
Tin on tin	5·90	69·55	22·666	3·305	11 12·5
Soft steel on soft steel	5·90	69·55	10·430	6·860	11 12·5
Cast iron on hard brass	7·75	54·25	8,390	6·581	8 0·5
Wrought iron on wrought iron	5·90	69·55	10·417	6·561	11 12·5
Brass on cast iron	6·75	54·25	8·196	6·745	8 0·5
Tin on wrought iron	5·90	69·55	11·672	5·846	11 12·5
Tin on cast iron	6·75	54·25	9·344	5·671	8 0 5

These tables show that the friction of tin on tin is less than that of any other two metals; that a journal of cast iron always gives less friction than a journal of wrought iron, except in the case of soft steel on wrought iron, which after tin on tin gives a minimum friction; that contrary to the general practise brass as either a journal or a gudgeon involves more friction than the harder metals, except when both journal and gudgeon are made of that material. It also shows that inasmuch as cast iron on wrought iron shows a smaller amount of friction than cast iron on cast, by seven per cent., and than wrought on wrought *by eight per cent. the traction is least on those railways where cast iron wheels are made to run on rails of malleable iron.* We will now subjoin a table of experiments on axle friction with the view of showing the results of metal on metal when unguents are used. This table is also copied from Mr. Babbage, and we regret that as that learned gentleman has omitted to state the dimensions of the machinery employed in those experiments, we are unable to apply the results in the cases given to the ascertaining of the respective coefficients of friction.

AXLE FRICTION WITH AND WITHOUT UNGUENTS.

Gun Metal on Cast Iron.

Weight on the axle.	Weight required to move it. Without unguents.	With black lead.	With oil.	With hogs lard.	Equivalent of weight for 1 lb. of friction. Without unguents.	With black lead.	With oil.	With hogs lard.
Cwts.	lbs. oz.							
1	16·0				7·00			
2	30·0				7·46			
3	44·0				7·63			
4	60·12				7·37			
5	112·0				5·00			
6	134·0				5·01			
7	154·0				5·09			
8	175·0				5·12			
9	200·0				5·04			
10	238·0			130·4	4·70			8·59
11		170·0	218·8			7·24	5·63	
Cast Iron on Cast Iron.								
10	173·8		131·1	117·4	6·45		8·54	9·55
11	228·0	161·0	140·0		5·40	7·65	8·80	

Yellow Brass on Cast Iron.

Weight on the Axle.—Cwts.	Weight required to move it. Without unguents.	With black lead.	With oil.	With hogs lard.	With anti-attition composition.	With tallow.	With soft soap.	With softsoap & black lead.
½			1·8	1·10			2·2	5·8
1		14·12	3·8	3·1	7·8	3·1	3·8	9·3
2		31·4	7·0	7·8	9·0	5·12	6·0	12·1
3		47·8	16·8	23·0	10·8	8·5	9·8	14·4
4		65·8	21·8	43 0	12·8	11·1	12·12	19·8
5		84·0	29·4	47 8	14·8	13·12	14·12	23·8
10	272·0		193·8	120·8	21·12			
11		181·0	200·12					
Equivalent of weight moved according to the above table for 1 lb. of friction.								
½			37 33	34·46			26·35	10·18
1		7·59	32·00	36·57	14·93	36·57	32·00	12·19
2		7·16	32·00	29 86	24·88	38·95	37·33	18·56
3		7·07	20·36	14·60	32·00	40·42	35·36	23·57
4		6·83	18·28	10·41	35·84	40·49	35·13	22·97
5		6·66	19·14	11·78	38·62	40·72	37·96	23·82
10	4·11		5·78	9·29	51·82			
11		6·80	6·13					

The deductions from the above results are that yellow brass on cast iron shows a higher friction than on gun metal or cast iron; and that this latter shows a higher friction than cast iron on cast iron: that oil and hogs lard are the best unguents for light loads; and that tallow, soft soap and anti-attrition composition may be used with most advantage in the case of heavy loads—the latter diminishing friction under a loading of half a ton by upwards of 90 per cent.

We will now offer a few remarks on the resistance to mechanical effect arising from the rigidity of ropes. We will commence our remarks on this subject by submitting the following table from Coulomb.

Coulomb's Experiments on the Rigidity of Chords passing over Rollers or Pulleys.

Nature of the chords.	Nature, weight and diameter of rollers.	Weight hung on each side of the roller. lbs.	Additional required to give motion.	Whole weight including the roller.	Resistance of roller previously determined	Am't of resistance chargeable to rigidity of rope.
No 3.—30 threads	Elm, Dia. 12 inches. Weight 110lbs.	100	5	315	1·5	3·5
		300	11	721	3·6	7·4
		500	20	1130	5·6	14·4
" "	Elm, Diam. 6 inches Weight 25 lbs.	200	18	443		
" "	Guaiacum Diam. 6 inches Weight 50 lbs.	200	16	466	2·8	13·2
" "	Guaiacum, Diam. 2 in. Weight 4½ lbs.	25	11	65¼	2·8	8·2
		200	52	456¼		
		25	1¼	101¼		
No 2.—15 threads	Guaiacum, Diam. 6 inches Weight 50 lbs.	100	6	256		
		200	11	461		
		500	24	1074	6·4	17·6
No. 1.—6 threads.	Ditto,	100	3	253		
		200	6	456	2·7	3·3

If an equal weight be attached to each end of a rope running over a pulley the two weights are in equalibrio; but owing to the friction on the axle of the pulley, as shown above, it will require a considerable addition to one of the weights to produce motion. The addition however found necessary to produce motion is much greater than the proportion necessary to overcome the friction of the axle—the difference being referable to a retarding force consequent on the rigidity of the rope. After loading one end until a slow motion is produced, the other ascending brings the rope across the pulley, causing it from its natural rigidity to oppose the strain that ends to bend it to the circle of the pulley. This causes the rope to stand out a little from the block, and the position of the rope showing the point of application of the force, the result is a preponderance in favor of that side of the pulley where, owing to the rigitity of the rope, the force acts with a longer lever.

Let the increase of leverage be put equal to a, the weight placed on one end of the rope W, the radius of the wheel or pulley equal to R, and the force or weight necessary to produce the least possible motion equal to F. The quantity F-W being the extra loading on one side necessary to produce motion is referable to two causes—the tension, and the twisting of the rope. Now the tension of the chord may be expressed by a coefficient multiplied into the

weight thus y. W, and the simple quantity necessary to bend the rope may be put $= x$. x and y are evidently variable quantities, seeing that they depend on the particular rope used, but for the same rope the force required may be expressed generally by

$$x + y \text{ W}.$$

Now the power of the pulley to bend the rope is directly as the radius of the wheel or pulley, and the strength of the rope is as the nth power of its diameter d, and consequently the general form of the above expression is

$$\frac{d^n (x + y \text{ W})}{\text{R}}.$$

But

$$\text{F R} = \text{W (R} + a),$$

and therefore

$$\text{F} - \text{W} = \text{W}. \ \frac{a}{\text{R}}.$$

F—W is the amount of increase necessary to produce motion between the two loads and consequently

$$\text{F} - \text{W} = \text{W} \frac{a}{\text{R}} = \frac{d^n (x+y \text{ W})}{\text{R}}.$$

If the values corresponding to the several known quantities in this formula be substituted in three of the cases for which results are furnished in the table of Coulomb, we can at once assign their proper values to the unknown quantities x and y. From this expression it appears that the rigidity increases directly as the weight; inversely as the radius of the wheel or pulley; and directly as a certain power of the diameter of the rope. The deductions from the above table of Coulomb agree with the deductions drawn here from the analytical formula, but the third that the resistance is as a *certain power of the diameter of ropes*, becomes in reasoning from the experiments that it is as *the diameter* simply of the rope. In the last and second last cases given in Conlomb's table, we observe that a rope of 6 strands charged with 200 lbs. requires to overcome its rigidity 3·3 lbs., while another rope of 15 strands, charged with the same load and under the same general circumstances requires for that purpose 8·2 lbs; results in the direct ratio of the number of strands in their respective ropes—6 : 15 :: 3·3 : 8 2. Proney deduced values for the unknown quantities in the above formula from the experiments of Conlomb, but found that as the rigidity of ropes varies with the length of time they have been in use, the power n varies from 1·7 with new ropes to 1·4 for ropes that have been made more limber by use. According to Proney the above expression for the rigidity of ropes would stand for new ropes

$$\text{F} - \text{W} = \frac{d^{1\cdot7} (2\cdot45 + 0\cdot053 \text{ W})}{\text{R}}.$$

for old ropes,

$$\text{F} - \text{W} = \frac{d^{1\cdot4} (2\cdot45 + 0\cdot053 \text{ W})}{\text{R}}$$

But to deduce a still simpler form of expression we may combine the deductions from experiment made as above, viz: that the rigidity increases directly as the weight, inversely as the radius of the pulley, and directly as the diameter of the rope. I express this algebraically :

$$\text{F} - \text{W} = \frac{d\text{W}}{\text{R}} \times z$$

when z is a constant coefficient to be ascertained by experiment. The experiments of M. Amontons show this coefficient to be 0·03125, and therefore to take up his coefficient which is found the best approximation in practice, the expression stands:

$$\text{F} - \text{W} = \frac{0\cdot03125 \ d\text{W}}{\text{R}}$$

Therefore to find the resistance due to the rigidity of a chord passing over a pulley, multiply the diameter of the chord in lines by the weight to be raised in pounds, and the product divided by the radius of the pulley in inches is the retardation chargeable to the rigidity of the chord. This loading necessary to overcome the initial rigidity of the chord leads to a new rigidity, seeing that the rigidity is in ratio of the weight. This new rigidity may be calculated for the new weight it results from by the rule for ascertaining the initial rigidity, and the resulting weight may again be used to ascertain the rigidity occasioned by itself, and so on until the resulting weight vanishes the sum of all all resistance of the rigidity being the resistance due to the rigidity of a chord required to raise the initial load.—Required the resistance of a chord 1 inch (12 lines) in diameter employed to raise 1000 lbs, over a pulley 5 in. in diameter ?

$$\text{F} - \text{W} = \frac{0\cdot03125 \times 12 \times 1000}{5} = 75 \text{ lbs.}$$

for primary rigidity:

$$\text{F} - \text{W} = \frac{0\cdot03125 \times 12 \times 75}{5} = 5 \text{ lbs.}$$

for secondary rigidity:

$$\text{F} - \text{W} = \frac{0\cdot03125 \times 12 \times 5}{5} = \tfrac{1}{3} \text{ lbs.}$$

for tertiary rigidity.

The rigidity may be considered to vanish at the second loading, and consequently the answer is

$$75 + 5 = 80 \text{ lbs.}$$

for gross resistance. M. B. H.

Proceedings of Scientific Societies.

INSTITUTION OF MECHANICAL ENGINEERS.

"On a Patent Solid Wrought-iron Wheel," by Mr. H. Smith of Westbromwich.

This wheel is made entirely under the forge hammer. It is disc-shaped, the disc part being ¾ inch thick, and gradually swelling out to the thickness of the nave and tire. To compare his plan with the ordinary one, the inventor drew a comparison between the most improved wrought iron wheel of the usual class, and his own. The former is manufactured as follows:—

Pieces of iron, with wedge-shaped ends, are brought together, all converging to a common centre. These are then welded together to form the nave or boss, and the inner ends of the spokes of the intended wheel. Other T-shaped pieces are then welded to the ends of these spokes, and again to each other, forming the inner tyre of the wheel. This done, a rolled tyre bar of a suitable length is bended into a circle of a proper diameter to go on the inner tyre, and is welded to form a perfect circular hoop. This hoop is then heated in a furnace and put upon the inner tyre, and then the wheel is immersed in cold water to occasion such an amount of contraction of the tyre as shall firmly fix it upon the wheel. Rivets or bolts are then passed through both to secure them together.

Now it is submitted that the whole process of thus producing a wheel is open to many well founded objections, such as the following:—

The possibility of a want of dexterity in the manipulation of the different parts, in the making and bringing them together; the chance of doing so when the iron is not in a proper condition for welding;—then, the uncertainty of the hoops or tyres being exactly the same length, or the wheels with the inner tyre of precisely the same diameter; and again, the amount of contraction of the outer tyre depending upon its slow or rapid cooling, will be affected by any variation in the temperature of the wheel itself, and the water in the "bosh" or cooling cistern and these of course cannot be kept uniform. All these circumstances are opposed to wheels being well made with *loose* tyres, whether with wrought iron naves and arms, or with cast iron naves.

In reference to the second head—durability, it is conceived, from the contingencies already alluded to, that it must be obvious, that a wheel made in one piece will be the more lasting; but on this point, the wheel which forms the subject of the present inquiry has other claims to prefer.

In consequence of the iron in the wheel being both granular and laminar, inasmuch as by the mode of manufacture hereafter explained, this result is insured, and the grain of the iron being of a denser and more compact character than rolled iron, it must doubtless be much stronger and more durable than any rolled tyre bar of piled iron, which is liable to lamination, and altogether of a shorter nature.

Again, the torsive and abrasive effects of the carriage breaks will not produce the same results on a solid disc wheel, as on one with a loose hoop or tyre of rolled iron.

Then, as regards repairing, when the tyre of the disc wheel is worn down so much as to require a renewal, the wheel can be put in the lathe and turned cylindrical, to receive a tyre in the ordinary way, secured on by bolts, screwed into the tyre from the inner side, or by countersunk rivets through the tyre; and it must then be a better wheel than any yet manufactured.

On the subject of cost, it can only be observed at present, that as the first expense does not determine this point, it must be left to be settled by the results of a sufficient experience.

The following is a description of the mode of manufacturing the new solid disc wheels. In the first place, a straight bar of hammered or rolled iron is taken, of 4 to 4½ inches width or more if required, and sufficiently long to form a hoop of such a diameter as is most suitable to make the intended wheel. Other pieces of bar iron are then laid flat and close together, and cut in lengths to the same circle as the hoop, to form the base of a "pile:" the hoop is then placed upon this foundation and filled with scrap iron. The whole is then put into a reverberatory or heating furnace, and when at the proper heat, is hammered in the tools or dies to form a mould;" the face of the hammer is recessed in such a shape as to form an approximation to the shape of one side of the intended wheel, but only about two-thirds of the diameter; and the anvil face has a circular recess flat-bottomed, into which the hammer face enters. Two of these "moulds" are then put together, back to back, heated in a similar way, and hammered between the tools or dies; but these tools embrace only a segment of about one-fifth part of the entire wheel. The "mould" is turned round horizontally during this process, being turned a little between each blow of the hammer, and it is thus hammered out to the form and size of the required wheel. The wheel is the put into an annealing furnace, and is planished between tools similar to the last, and the wheel then only requires the tyre and the nave turning in a lathe, and the centre boring out.

By this mode of manufacture, it will be perceived that Low Moor iron, or any other description of iron or steel, can be used if required for the tyre of the wheel, and thus in all cases insure a clean wearing surface, and a compound character of fibrous and granulated iron, which it is believed no other system of making wheels affords. The centres for large spoke wheels are also manufactured in one solid piece in a similar manner by tools or dies.—The top and bottom tools are both alike, and are recessed in the form of the nave of the intended wheel with a short portion of each of the spokes radiating from the nave. The centre of the wheel is thus stamped out with a hammer with a portion of each of the spokes about a foot long, ready for welding on to the T pieces, to form the inner tyre and the remaining portion of the spokes. A thin web or fin is left in the centre between the spokes, which is afterwards cut out by the smith. The object of this construction is to surpass in certainty of soundness the precarious method of making them at present in use. It is unnecessary to urge the importance of obviating as far as possible, the occurrence of such accidents as have too frequently happened in consequence of defects of railway wheels; but a few of these cases may be alluded to here, in illustration of the subject.

The accident on the Edinburgh and Northern railway in October last, when the tyre of the leading wheel of the engine broke, and threw the train off the line: that on the East Lancashire railway in November last, where the tyre broke off one of the carriage wheels; that upon the Brighton railway in September last, when the tyre of one of the engine wheels broke, throwing the train off the line: and that upon the Great Western railway, about two years ago, where the tyre of a carriage wheel broke, and a portion of it broke through the carriage, causing a fatal accident.

With the view of obtaining some practical information upon the comparative resistance of the air to the revolution of the disc wheels and of the ordinary spoke wheels, some experiments have been tried at the Vulcan Iron Works, Westbromwich, by Mr. Henry Smith, with the assistance of Mr. Marshall, the Secretary of the Institution; and the results of these experiments are appended in the following table.

EXPERIMENTS ON THE RESISTANCE OF THE AIR TO THE SPOKES OF WHEELS.

Vuulcan Iron Works, April 17, 1849.

No. of experiment.	Description of Wheel.	Weight of Wheel.	Weight suspended on rope.	Distance fallen by weight.	Total time of revolutions of wheel.	Total number of revolutions of wheel.	Av. speed p. mile pr hr.	Length of rope.	Time before rope was detached.	Revolutions ditto.	Weight of the rope.
	Wheel.	lbs.	lbs.	Ft.	Secs	No.	M	Ft.	Secs	N	lb
1	Losh.	451	56	270	55	148	17	270	15	38	0*
2	Disc.	414	56	270	62	161	17	270	15	38	0*
3	Losh.	451	56	279	60	166	18	355	17	50	7†
4	Haddan	423	56	279	60½	176	19	355	17	50	7†
5	Disc.	414	56	279	68	220	21	355	17	50	7†
6	Disc.	414	56	279	66	222	21	355	17	50	7†
7	Disc.	414	71½	279	75	257	22	355	12	50	7‡

These experiments were performed at an old mine shaft 270 feet deep. The axle was placed across the top of the shaft, and carried by two bearings with brass steps; the wheel under experiment was fixed on one end of the axle outside the bearings, and the counter connected to the other end of the axle. The counter was so graduated and arranged that the most correct observation could be taken of the number of revolutions completed in each case.

A drum 2 feet 3½ inches diameter was fixed on the centre of the axle, and a rope ⅝ inch diameter was coiled on the drum, with the moving weight attached to the end of it, hanging over the centre of the shaft; the other end was not attached to the drum, but held only by the grip of the second turn of the rope, so that when the rope was run off the drum by the weight falling to the bottom of the shaft, the end of the rope detached itself from the drum without any check. As there was no means of descending the shaft to bring up the rope and weight, a tail rope of the same length and size as the main rope was attached to the weight at one end, and the other end made fast at the top of the shaft, the rope hanging double halfway down the shaft; this served to bring up the weight and main rope after they had fallen to the bottom of the shaft in each experiment. These two ropes weighed 7 lbs. each, and the weight of the main rope caused a gradual acceelleration in the moving weight, varying from nothing at the beginning of the descent to 7 lbs. at the end; whilst the tail rope, acting at first with half its weight, caused an increase varrying from 3½ lbs. to nothing at the end; whilst the tail rope, acting at first with half its weight, caused an increase varying from 3½ lbs. to nothing in the end. The result was, therefore, a total increase of the moving power, varying from 3½ lbs. at the beginning of the fall, to 7 lbs. at the end; and as this was the same in each case, and the moving weight was also the same (56 lbs.,) its effect may be neglected in ascertaining the comparative results for the present purpose.

* No tail rope: the rope was detached before weight touched the ground.

† With tail rope.

‡ Ditto, and stone fixed on iron weight.

The wheels tried in the experiments were one of the solid wrought iron disc wheels, a wrought iron flat spoked wheel of Losh's pattern, with spokes 3 1-16 inches broad, and a wrought iron flat spoked wheel of Haddan's pattern, with spokes 3 1-16 inches broad. These wheels were selected as near the same weight as was practicable, Losh's wheel being one-eleventh heavier than the disc wheel, and Haddan's wheel one-forty-sixth heavier than the disc wheel; all the wheels were 3 feet diameter.

In the four experiments, Nos. 3, 4, 5 and 6 (see the preceding table,) the time in which the rope was run off the drum was the same in each case—17 seconds; and as the number of revolutions in that time was also the same in each case (50) in consequence of the same rope being used, it follows that the velocity of the wheel at the moment of the power being detached was the same in each case and consequently the comparative resistance in each case is indicated by the comparative length of time that the wheels continued in motion after the power was detached. In the experiments, Nos. 1 and 2, the weight and rope were dropped down the shaft without the addition of a tail rope to pull them up again, and the rope was shortened to 9 feet less than the depth of the shaft, so as to ascertain the exact moment of the power being detached from the drum. The time was the same in both cases, 15 seconds from starting to the power being detached, and the number of revolutions also the same, 38:—this gives an average velocity of the circumference of the wheel from starting equal to 16 miles an hour, or a final velocity of about 32 miles an hour, at the moment of the power being detached.

In No. 1 experiment with Losh's wheel, the total time of the wheel revolving was 55 seconds, and in No. 2 experiment with the disc wheel it was 62 seconds; then deducting in each case the 15 seconds during which the power was in action, the results are 40 and 47 seconds respectively for the time of motion after the power was detached; which are in the proportion of 100 to 118, showing *that* 18 *per ct. more resistance* was experienced by the spoke wheel than by the disc wheel. In the four experiments, Nos. 3, 4, 5, and 6, the time was 17 seconds from starting to the moment of the rope being detached, and as the rope was in these cases longer than the depth of the shaft, so that the weight stopped at the bottom before the rope was detached from the drum, 14 seconds may be taken as the time during which the power was acting; Nos. 1 and and 2 experiments, where the weight of the tail rope was not acting, this time was ascertained to be 15 seconds.

In No. 3 experiment with Losh's wheel, the total time of the wheel revolving was 60 seconds; in No. 4 with Haddan's wheel, it was 60½ seconds; in No. 5 with the disc wheel, the total time was 68 seconds and in No. 5 with the same wheel, 66 seconds—the mean time of the disc wheel being 67 seconds.

Then deducting in each case the 14 seconds during which the power was in action, the results are 46 seconds with Losh's wheel, and 53 seconds with the disc wheel, for the time of motion after the power was detached; which are in the proportion of 100 to 115, showing that 15 *per oent. more resistance* was experienced by the spoke wheel than by the disc wheel.

The average result from both sets of experiments is 16½ *per cent.* difference of resistance in favor of the disc wheel, and this is attributable to the additional resistance of the air caused by the flat spokes of the spoke wheel, as the friction of the axle caused the same resistance in each case; the weight being nearly the same of each wheel, and to prevent any change in the friction of the axle, the wheels were changed without taking the axle out of the bearings during the experiments. The axle journals are 2½ inches diameter, and 2½ inches in length; and the friction of the journals was overcome by a weight of 15½ lbs. acting on the drum, when the wheel was upon the axle, and by a weight of 5½ lbs. when the wheel was taken off.

As these experiments were made with wheels revolving on a stationary axle, it is requisite to consider what would be the comparative effect if the wheels were rolling on their circumference whilst revolving at the same rate on their axle, as in the practical case of the wheels of railway carriages running on a railway. In the former case, the motion of the spokes is at a uniform velocity, and always at right angles to the direction of the spokes; but in the latter case of a rolling wheel, the motion of the spokes is at a varying velocity, and always inclined obliquely to the direction of the spokes, except at the moment of each spoke being in the vertical position. The outer ends of the spokes move in a cycloidal curve, having double the velocity of the revolution of the wheel when they arrive at the top of the wheel, but becoming stationary at the moment of touching the rail at the bottom of the wheel, the average velocity of the outer ends of the spokes is about 1¼ times greater than when the wheel revolves on a stationary axle at the same rate of revolution. The average velocity of the inner ends of the spokes is about 3 times greater when rolling than when revolving on a stationary axle. As the resistance of the air increases in proportion to the square of the velocity, the average resistance to the outer and inner ends of the spokes will be about 1⅔ and 9 times respectively greater in the former than in the latter case. But this is reduced by the oblique position of the spokes as regards the direction of their motion in the rolling wheel; the motion of the spokes being twice during each revolution in the direction of the spokes, and, consequently, the resistance of the air reduced to nothing at those points. By measuring upon the diagram the comparative velocity of several points in a spoke in various positions during a complete revolution of the wheel, and the inclination of the spoke to the direction in each of these positions, the following approximate result has been obtained:—that the total resistance of the air to the spokes when the wheel is rolling, is 3 times the total resistance to the same spokes when the wheel is revolving at the same rate of revolution on a stationary axle.

It follows, that the result of the foregoing experiments has to be multiplied by 3, and, consequently, the excess of the resistance of the air to the spoke wheel over the disc wheel would have been 3 times 16½, or 40 per cent., if the whels had been rolling, in this case, instead of revolving on a stationary axle. This excess of resistance of the spoke wheel would not be so great in the practical case of the wheels of a railway carriage running on a railway as the friction of the axle journals is greater in that case than in the experiments, from the weight passing upon them being greater; and, consequently, the resistance of the air to the spokes of the whcel would then bear a less proportion to the friction of the axle journals.

Mr. Smith exhibited a finished specimen of his wheel, and one of the moulds in the first stage of manufacture; also a centre for a wrought iron spoke wheel, which he had manufactured that day; it rang as clear as a bell when struck by a hammer.

Mr. M'Connell said, he had tried two pairs of these wheel centres at Wolverton, and had found them perfectly solid, and they were an excellent job; they were for the leading and trailing wheels of an engine 3 feet 9 inches diameter.

Mr. Smith said, in answer to questions, that his hammer with which the wheels were forged was rather more than 9 tons weight; it was a helve taking up under the belly, and was driven by bands.—The weight of the finished disc wheel was about 4⅞ cwt.; it was made with the first tools that he had started with, and he had adhered at present to his original section of wheel, but he did not profess it to be the best form of section that might be adopted. He had made about 200 of these wheels; there were some now at work on the Birmingham and Gloucester line, and he had an order to prepare some for the travelling post office, to register the number of miles run by them. As to the cost of these wheels he was ready to put himself into competition with other parties

The chairman remarked, that the durability or life of the body of the wheel was so very much greater than that of the tyre of the wheel, which must be renewed when only about a tenth of the life of the wheel was gone, and would then require a secondary process to put on the new tyre; and, consequently, it appeared to him preferable not to incur any additional expense and trouble by forging the tyre on to the wheel, but to manufacture the disc alone, and put on a separate tyre in the first instance.

Mr. Smith replied, that it was not any more trouble to forge the wheel with the tyre than without it;

it was easily done, and the cost of manufacturing the wheel would be less than putting on a separate tyre. There would be a little more trouble and expense in retyring the wheel for the first time, but he thought that the iron of the tyre would be much more durable than any rolled tyre could be, on account of the process of manufacture.

Mr. Woodhouse asked what advantage the wheel would possess over a cast iron wheel if it were forged without the tyre; but he thought there was certainly danger of fracture from expansion in a cast iron disc wheel.

Mr. Beyer remarked, that he had seen some cast iron wheels that he thought would last as long as wrought iron ones, and he never could understand why they were not more used; there were many wheels of cast iron, even large driving wheels of a feet diameter, that had been running many years, and he thought it was an important question of economy in railways.

The chairman observed. that when locomotive engines were begun, some 25 yearr ago, they were driven to wrought iron wheels, and thought it a great advantage; and he hought that for rapid railway travelling, they must admit, as a body of engineers, that wrought iron was better for such purposes. The present facilities for the manufacture of wrought iron had been so strikingly shown to them, on the present occasion, that he thought it was hardly possible to save anything worth mentioning by the adoption of cast iron, particularly in the expense of a pair of large driving wheels.—*Glasgow Practical Mechanics' Journal.*

AMERICAN RAILROAD JOURNAL.

Saturday, August 4, 1849.

Preliminary Surveys

The preliminary survey involves more important considerations than any other step in the progress of a public work. It is this which determines gradients, curves, locks, lifts, cuttings, fillings, bridgings—in short, the proportion of power and effect, the amount of first cost and also of subsequent maintainance. The preliminary survey is that part of the duty of an Engineer which demands the greatest care, the fullest information, the most serious consideration, as affecting more deeply than any other part of his duty *the pockets of his employers;* and therefore it is that the location of a public work with undue haste, on insufficient, or perhaps even inaccurate data is one of the worst misfortunes that can befal a proprietory. We make these remarks as an apology for considering a question with which all practical Engineers may be presumed to be familiar.

Strange as it may appear, works are however too often in both this country and Great Britain located permenantly on insufficient data. A judicious contractor always examines the character of the strata along a line of work before he sends in his estimate; and truly the Engineer as a man of honor owes his employers the duty of considering this condition of cost in his preliminary survey. The writer of this has always made it a practice to bore at intervals along his lines of survey; and indeed experience has shown him that the *most favorable section* will sometimes furnish the *worst possible location.* It is therefore recommended very earnestly that no preliminary survey be considered completed until the strata at several points along the competing routes shall have been ascertained by means of boring irons. Boring rods are very simple in their construction, consisting in fact of a series of joints screwed on to each other and carrying at the upper end a cross-handle, at the lower a chisel point or augur. For general use they may be made of five or six two-and-a-half feet lengths of inch or inch-and-a-quarter iron, the lengths being fitted to each other by means stout-threaded male and female screws, all cut from the same die. Two parts are used, one after the other, at the lower end of the borer—one a joint having at its end, like the ordinary quarry jumper, a chisel point for forcing a passage into the strata;—the other a joint having at its end, as in the augur, a semi-cylindrical hollow with cutting end and edges in order, when worked into the hole made previously by the chisel, to draw up the material for the purpose of ascertaining its character. The upper joint of the borer carries at the top a cross stick, which, projecting for some two feet at each side of the boring iron, furnishes the means of forcing down and then revolving in the hole, first the chisel and afterwards the augur. For every additional depth of boring an additional joint is screwed on; and in this way considerable depths may be attained. Iron dogs or wrenches are necessary for gripping the irons when about to be withdrawn from the hole. Four men, working two by two alternately, will bore in ordinary strata for depths not exceeding ten or twelve feet from 40 to 80 feet per day of ten hours.

Inaccurate data is even still worse than insufficient data, and on this account the best class of assistants that can be had to make preliminary surveys the better. Liberal pay will obtain a good class; and therefore lead to true economy: while the pay that offers inducements to only an inferior class of assisstants, will in all probability occasion losses a thousand fold greater than the miserable sum economised in pay.

No Engineer can place dependence on the levels obtained by the sliding vane on a staff: it is quite evident that as the staffman in such cases calls out the reading, the staffman is in point of fact the person who makes the section.

We were a little surprised to find a few days ago that clumsy, and as we thought exploded contrivance, the vane-staff, employed on a line running out of New York. Gravatt's staff furnishes a simple and direct means of taking levels; and as in using it the staffman is confined to his own proper office, *the responsible party* reading off and registering the levels, we can hardly think that any young Engineer anxious to make a character in his profession will attempt a section with any other staff. The form of field book used in levelling is very varied: we have found the following the most convenient:

——Section of———from———to———

——day of———184 .

Lengths.	Staff.	Reduced Level.	Planes of collimation.	Remarks.
	3·48	100.00	103·48	Bench Mark No. 1.—Soffitte of Keystone of Richmond B'ge (middle arch)
3·20	5·19	98·29		Boring No. 1.—See registry of boring.
6·30	7·26	96·22		
9·10	4·92	98·56		
	4·19		102·75	B. M. No. 2—Cut on rock at water's edge.
11·15	5·27	97·48		
12·35	6·31	96·44		
14·40	4·02	98·73		
17·10	3·28	99 47		

This is seen at a glance to be less complicated than the usual form of field book. The 'lengths' are as usual the distances between the several points at which the staff had been held; the column 'staff' showing as in other forms the reading at these points The plane of collimation in the above form shows the height above datum of the line of vision or the line of the axis of the telescope; and as seen in the form is therefore different at every setting up of the instrument. The reading on the staff is of course the difference of level between the plane of collimation or plane of vision, and the point on which the bottom of the staff rests; and consequently the reduced level is obtained by subtracting the corresponding reading from the height of the plane of collimation. For example; assuming the height above datum of "Bench Mark No. 1' at 100, the plane of collimation being as shown on the staff, 3·48 above this has a height above datum of 103·48: Again, the point at 'boring No. 1' being as read from the staff 5·19 below this same line of vision or plane of collimation, has a height in reference to the datum of 103·48–5.19 =98·29. In river works it will be found necessary to add to the above table a column for 'soundings:' the reduced level for water surface may be written in blue or red ink in order to prevent any confusion in plotting the section from the field notes. The liability to error in inking over pencil notes or of their becoming obliterated, should show the necessity of using ink in the field; and indeed only by using ink in the first instance can the notes be considered original notes, these being of course the only ones on which the principal Engineer can place any reliance. No young Engineer should give up his detailed levels unaccompanied by proper checks; though we would recommend the practice of employing a superior Engineer to check throughout on the several bench marks left by the parties who made the detailed section. Too much attention cannot be given to the correctness of levels: an unfortunate series of errors in a section lead to the abandonment of the Kinnegad branch of the Royal Canal in Ireland, after an outlay of some hundred thousand dollars.

After having made trial sections along the several routes that offer themselves on a careful examination of the country between two fixed points of a public work, the best means of embodying the result is to show on a plan comprehending all the routes surveyed the levels of the country at the several points of the several sections, all these levels being expressed in figures having reference to one and the same datum-line. In some cases the profile of a country may be ascertained most conveniently by a series of cross sections at right angles and in connection with a longitudinal section between the terminal points, these cross sections being made from known bench marks on the longitudinal section, and the initial level of each cross-section being the reduced level of the bench mark from which it starts. Having the heights registered at their corresponding points on the map, only very little little skill is necessary to fix on the route offering the most favorable surface; and when a difficulty ocurs in the choice of two lines of surface it may be settled generally by laying, for the purpose of comparison, a tracing of one section over the other section. This method will determine the line of most favorable section; but we repeat again *the line of economical location cannot be determined without full information as to the nature of the substrata.*

M.B.H.

Massachusetts.

GRAND JUNCTION RAILROAD AND DEPOT COMPANY.

We are indebted to a friend for the perusal of the second annual report of this company, which has for its object, the construction of a railroad to connect the leading railroads entering Boston with the depots of this company, situated upon the navigable waters of East Boston, so that goods and merchandize inten-

ded for importation or exportation, can be received directly from vessels upon the cars, or be transferred from them to vessels.

No person can have visited Boston without feeling the necessity of such an arrangement independent of any commercial considerations. Railroads centering there, have now no connection, and all freight received by one road and designed to be forwarded by another, is trucked through the City. This necessity, in addition to the expense and waste incurred fills up the street with so many loaded teams as to cause a serious inconvenience to the safety and comfort of its citizens. This evil will be almost entirely remedied by the road proposed. For the purpose of making ample provision for the accommodation of the business of the various roads, this company is preparing two depots on the shore of East Boston, in the very centre of the harbour of the city, and adjoining the docks of the British steamships It is accessible from the open sea on the south to the largest class of ships, and its docks are protected from the easterly and north-easterly storms. It contains, 1,465,920 square feet of land, piers and docks, divided as follows, viz.:—

1,058,251 square feet of land,
183,195 " " oak piers,
244,474 " " docks,

and has a frontage on Marginal Street of 1,650 feet in length.

Depot No. 2, at the bridge over Chelsea Creek, contains about 456,721 square feet, with a water front of 1,000 feet.

The real estate owned by the company comprised in these two depots amounted to 1,925,641 square feet, including 9,351 feet in length of wharf accommodations, in the deepest and best part of the harbour for commercial purposes. The railroad will connect both depots with four of the principal railroads entering the city, and through them with the interior roads reaching to the Canadas and great lakes, viz.:—the Eastern railroad, Boston and Maine Fitchburg, and Boston and Lowell, and will be 6 and 6-10ths miles in length. The bridge over Chelsea Creek, and part of the road in Chelsea, will be constructed this season; the Mystic river bridge and the remaining portion of the road will be completed the next year.

The receipts of the company have been $638,550 92, (from assessments, $580,291 66,) and the expenditures $614,767 42.

From these additions to the business facilities of Boston, a corresponding increase of her commercial importance is counted upon, and the directors of this company profess themselves confident that these facilities, which they are providing, are alone wanting to give to her a commercial superiority over all her Atlantic rivals. Boston, it is admitted, owes her recent rapid growth to her railroads, and to illustrate their influence on the growth of a city the progress of New York and Boston, in wealth since 1840 to show this is compared. the valuation of each city since 1840 and 1848 is taken.

NEW YORK.

	1840.	1048.
Real Estate	187,121,464	193,029,076
Personal "	65,721,690	61,164,451
	252,843,154	254,193,527
	Increase.......	$1,350,373

BOSTON.

	1840.	1048.
Real Estate	60,474,200	100,403,200
Personal "	34,157,400	67,324,800
	94,631,600	167,728,000
	Increase.....	$73,097,400

Increase in favour of Boston,......$71,474,027

In reference to this result the report says, "if the wealth of Boston has increased from 1840 to 1849, the immense amount of *seventy three millions*, it needs neither argument nor illustration to show that its trade and commerce must have increased also. It would be curious to trace to its causes, and follow to its results, this new and vast accumulaiion of wealth in Boston during the past eight years. Cities as with men, have their seasons of prosperity or of depression. Periods of prosperity may be easily pointed out in the history of our own or other cities of the Union. Newport, Salem, Newburyport, Portsmouth, Philadelphia and New York, have had their periods of high prosperity and rapid growth in population and wealth. At one time, the facilities of trade between Philadelphia and the great valley of the West were highly advantageous to that city; and her prosperity was only checked by that work of wisdom and wonder of the time, the Erie Canal, which gave prosperity to New York. Later still, and her progress has been checked by the Massachusets railroads, and Boston, in the order of events, is having her season of prosperity, which we are all striving to perpetaute and render permanent."

In looking at the commercial history of Boston, the directors of this company find, that although from 1832 to 1848 her importations increased from $15,769,572 to $47,110,761; her exorts in the same time increased from $10,102,762 to $10,513,132, as exhibiting an apparent singular state of things, indicating a want of one element of commercial greatness a larger export trade. To secure this trade, she proposes to make herself the Atlantic outlet of the produce of the west; and the directors of this company affirm that she has the capacity to do this by a continuous line of railway striking the St. Lawrence at Ogdensburgh. In relation to this the report says—

"Boston must become an *exporting city*, and flour from the west can be placed on shipboard in our city at a less cost per barrel than it can be done in New York, even with the aid of her noble Hudson. *A barrel of flour can be brought from Cleveland, Ohio, to Boston in two or three days less time than it can be carried to New York from the same point, and at less expense.*"

There never was a greater error than this. Let us look at the matter a moment. Oswego, on Lake Ontario, may be made a common point for all produce of the west intended for either city, because all designed for Boston via Ogdensburgh must pass this point, through which also it can be forwarded most cheaply to New York. On the completion of the Hudson river railroad, this point will be distant from New York, by railway, 329 miles, over a route remarkably favorable for its grades. Produce designed for Boston must go from Oswego to Ogdensburgh by water a distance of 2 or 300 miles. From thence it cannot reach Boston by a continuous line of railway short of 450 miles, and surmounting the Green Mountains in its course. Now by what process of reasoning men can persuade themselves that the greater distance can be performed at less expense and in less time, passes our ken. It is undoubtedly true, and it must always continue to be true, that Boston can get her western produce via New York cheaper than by any other route.

If such are facts that cannot be disproved, then money wasted upon the hypothesis of opening a better and cheaper route is, as far as this object is concerned, thrown away. And the less that any such idea mingles with her schemes of internal improvement the better. Roads having this oject in veiw may be profitable investments, but their profits must flow from other sounces of business than this.

Portland and Montreal Railroad.

We have been furnished with a copy of the report of the treasurer and directors, of the Atlantic and St. Lawrence railroad, for the year ending June 30, 1849.

This company has a standing order, requiring the Directors to publish a report of their doings, for distribution among the shareholders. before the annual meeting.

By the report of the treasurer it appears that the receipts and disbursements for construction of the road to the above date, and also the receipts and expenditures on Income account since the opening of the Road have been as follows.

There have been received from assessments on shares in the Capital Stock,		$864,914 94
Rents and wharfage,		1,978 39
Amount borrowed of Income account, and demand Loans,		58,314 06
City of Portland Loan, amount scrip sold,		135,000 00
Bills Payable,		275,421 26
		$1,305,628 65
The total amount paid and chargeable To construction is:—for Station houses and for Depot lands in Portland, and improvements thereon,		$114,787 91
For Land damages,		35,009 55
For Fencing,		16,361 54
For Equipment for operating Road,		100,275 79
For Interest on Loans in anticipation of assessments,	17,791 49	
For Interest on city of Portland Loan,	2,400 00	
		20,191 49
For Interest paid Stockholders on assessments,		47,807 46
For sundry acc'ts., including Grading, Bridging, Superstructure, Office Expenses, Engineering, &c. &c.		941,042 62
Total,		$1,275,476 27

The whole amount of Bonds that have been received from the City Treasurer, under the Act authorizing the City to aid the construction of the Road, is		$262,000 00
Amount sold as above,		135,000 00
Balance on hand and available,		$127,000 00
There has been paid to the Commissioners of the sinking fund, created by the City of Portland Loan Act,		$7,240 00
The whole number of shares taken of the Capital Stock, exclusive of those issued as security for Loans is	10435	
Deduct number released and canceled,	290	
Whole number now available,	10145	
equal to		$1,014,500 00
On which is paid as above,		864,914 94
Leaving uncollected,		$149,585 06
In part of which the Company holds notes upon conditional receipts given, amounting to		31,929 94

Of the balence uncollected (the last assessment not having been called for) it is supposed, nearly the full amonnt will be realized.

The Road was opened for travel to North Yarmouth, the 20th of July last—to the Junction in Danville, and to Lewiston over the Androscoggin and Kennebec Railroad, the 4th of December, and to Mechanic Falls, the 19th of February. The results are shown below:

Total amount received from 68445 passengers is	$35,473 57
" " " Merchandize,	21,550 14
Total Receipts,	$57,023 71

The current expenses are:

For maintenance of way,	$7,376 86
" Locomotive Power,	8,781 83
" Train Expenses,	5,667 49
" Office Establishment,	2,347 82
" Station Expenses	2,596 26
" Am't. allowed Androscoggin	

and Kennebec Railroad
Company, for use of Road 5,320 00
.... 32,090 26
....
Net Receipts, $24,933 45

This amount should be credited Interest to reduce the construction account, inasmuch as interest has been paid to shareholders on their stock.

In speaking of the prospects of the road the directors say—

"We have not yet had time to test the actual productiveness of the Road, and if the receipts should equal our anticipations, there will be no difficulty in disposing of stock, either in payment of contracts, actual sales, or as collateral for Loans, at its par value. Other Roads are being opened, which will add materially to our business. The Androscoggin and Kennebec Road is completed and in operation from the junction in Danville. 25 1-2 miles to Winthrop, and the Kennebec and Portland Road is opened and in operation from North Yarmouth to Bath, 23 miles. Both these roads are at the present time run in connection with our Road, and must greatly increase its businsss, and still more, as these connecting roads are extended.

The road from Mechanic Falls to Buckfield, 13 miles, is nearly graded and ready for the superstructure, and will probably be completed and opened early in October next. This road penetrates a well settled and fertile part of Oxford county, and will command much of the business of the eastern part of that county, beyond its terminus at Buckfield, and contribute essentially to the business of our Road.

Aside from these considerations, further movements on our part should be made to keep pace with the progress made by our Canadian friends. We understand they are now making efforts to raise means to complete one half their line of Road, in order to avail themselves of Government aid for the residue, a bill having passed the Canadian parliament at its recent session, to aid such Railroads as may have expended one half the amount required for their completion, by guaranteeing the interest and payment of Loans, for the other half. At this time the St. Lawrence and Atlantic railroad company are negotiating for means of further progress, and as we are now, somewhat in advance of that Company in the joint undertaking, there seem to be good reasons for awaiting the result of their present efforts. The monetary condition of the two countries, and the disturbed state of the public mind in Canada may defer for a time the completion of both roads to their point of junction at the Boundary; but that these difficulties will be speedily surmounted, and the roads be completed through within a reasonably short period, we entertain no doubt. It is so clearly demonstrable, that the joint road from Portland to Montreal, when once completed, would be one of the best paying roads in the country, connecting, as it would, in the cheapest and shortest line the immense business of the Great Lakes with the Atlantic Ocean, that there can be but very little doubt of raising the necessary means on both sides for accomplishing this great enterprise, as soon as there is sufficient relief in the money market here and in Canada. An act has been passed by the Legislature of Vermont at their passed session, authorizing the extension of your charter through the North Easterly part of Vermont to the Canada line, thus, with the grants previously made by the Legislature of New Hampshire, extending your charter from Portland to the boundary line of Canada in Vermont.

The whole amount expended in the construction of the road up to July 1st, including interest paid on assessments, and loans, according to the treasurer's report, is 1,275,476.27cts,
Estimated amount required to complete the road to South Paris 130,000,00
....
Making cost of whole Road from Portland to S. Paris, 47½ miles, } 1,405,476.27 cts.

The annual meeting of the company is to be holden on the 7th of August instant.

The Public Works of England.

NO. 3.—CALEDONIAN CANAL.

The whole progress of the Caledonian Canal is so entirely illustrative of the conduct of public works in this country, that a detailed account of it would not be undesirable.

The Act for the purpose, which passed on the 27 Dec., 1803, granted to the government the sum of £20,000, for the undertaking. The engineering and conduct of the canal was entrusted to Telford, but the commissioners appointed another eminent engineer, Mr. Jessop—to survey the line and calculate the cost. The estimate of these gentlemen for the whole work was £474,000, exclusive of the price of land, which expense, the supposed, would not be considerable—many proprietors have offered their land gratuitously, and the general value of land in the country through which the canal passed not being great. The expense for the first year was calculated at £75,000. Before the close of the year docks in both seas were in a considerable state of forwardness; they were set out at 400 yards in length and 70 in breadth: 400 bolls of oatmeal (56,000 lbs.) were lodged in storehouses, and delivered to the workmen at prime cost; 150 persons were set to work, besides persons making and repairing utensils—a number in those days thought very great, though a railway engineer would smile at it. The average wages to the workmen was 18d. a day. Fir was cut down on the spot or in the neighbourhood, costing from 10d. to 14d. the cubic foot—imported timber would have been twice as dear, and answered no better. Thus the preparatory arrangements were begun with much forethought and economy.

The salary of the engineer, Mr. Telford, was at the rate of three guineas per diem, including travelling expenses, with some allowances for one or two lengthened journeys. This sum would make Mr. Brunel stare. The salaries of the superintendents were fixed at from 50 to 150 guineas per annum.—The valuation of the land was aout £15,000.

Great apprehensions were entertained that the nature of the soil would interpose insuperable difficulties. Mr. Jessop's report, in the actual state of geological knowledge, is curious. "It seems (he states) probable in some early age of the world the immense chasm, almost two thirds of which is still occupied by water, has been nearly (why did I not say quite) open from sea to sea, and that the land which now separates the locks has been formed from the decay of the adjoining mountains. This decay is very apparent in Ben Nevis, which is evidently a part only of a much greater mountain which seems to have included the present one and two adjoining mountains of lesser height. Impressed with this idea, I was very apprehensive, after the first trials of the ground at Inverness, that many other parts would be found similar to it. That greatest part of the land there being composed of gravel and sand, is so open that the water in the pits sunk and rose with the tide. Fortunately, a place has been discovered where a foundation on clay may be got at by surrounding the pit with a cofferdam." It was found generally that the gravel and sand had a sufficient admixture of earth to exclude water.

The width of the lock was calculated at 38 feet, length in the chamber 152 feet: 23 locks were provided for, at an estimate of £171,327, and as many bridges at an es imate of £34,000. The common cutting of the canal was estimated at £142,000, the depth being 20 feet, with a bottom of 50 feet—a slope of 18 inches to a foot, and 90 feet width at the surface. The remainder of the estimate was for deepning rivers, cofferdams, aqueducts, culverts, with a sum of £12,000, for steam-engines.

By the time a single year had passed, the usual fate attended these estimates. It was found that the locks would be too small, as frigates of 44 guns might be required to pass—the length was extended to 185 feet and the breadth to 43, with an addition to the estimate of £122,624. Then side locks were required for small vessels, to save the wear and tear of the large locks; these were further estimated at £75,200. Iron railways were constructed for the purpose of conveying stone from the quarries opened in the vicinity of the canal—one of them 11,000 yards, a great length in those days for such a purpose.—The number of labourers was increased from 150 to 900. The greatest difficulty was encountered in the erection of the sea locks, in the construction of which a good deal of ingenuity was exhibited.

In addition to the increase of other estimates, the salaries, as usual, were increased. Two resident inspectors were appointed, and several other officers, at allowance of upwards of £200, yearly each. Far more trouble and expense than was anticipated occurred in the valuation of the land, which the proprietors did not seem disposed to part with gratuitously, nor at other than a high value.

A great improvement on the usual practice of canals was introduced at the very commencement of the undertaking in the construction of the bridges. On the Forth and Clyde canal wooden drawbridges had been used at first, raised by chains and timber framings; as these wore out, cast iron bridges were substituted, raised by a wheel and pinion; but the Caledonian bridges were of iron, on the swivel principle, which had been already used in the London Docks. One of the most important works in the early stage of the canal was the altering the course of the rivers Ness and Oich. The beds of both of these rivers were required for the canal. The embanking necessary was very extensive.

In 1820 the first steam-boat was constructed for the canal by Mr. Henry Bell, the introducer of steam navigation into England, and the person who established the well known steam-boats on the Forth and Clyde,

On the 23rd of October, 1822, the canal was opened from sea to sea with very great ceremony. The principal landlords along the land fired salutes and gave entertainments on the occasion, and the papers of the day described the affair as one of great magnificence. The passage back, from west to east, was made in 13 hours. The depth of water was then only 12 feet, but dragging machines were in active operation for the purpose of deepning the canal to 20 feet.

The entire time, from the commencement to the opening of the canal, was 19 years. It was begun in October, 1803, and opened, as we said, in October, 1822. The expenses to this time were £912,373—of this no less than £47,886, was paid for land which was to have been granted gratuitously; £616,770, was paid for labour, and did vast good to the country. The steam machinery, estimated at £10,000 only cost £5596, but the whole machinery cost upwards of £121,408. The cost of management for the whole time averaged under £1500 per annum. On the whole, and by comparison with moderate undertakings, this great enterprise was conducted with extreme economy and great ability. At times the persons employed on the canal at one time amounted to above 900.

In the first year of the opening 307 vessels entered the canal, of which 37 passed from sea to sea. This was then considered a favourable account. The tolls fixed were a farthing a ton per mile, with an increase upon very short voyages.

From May, 1823, to May, 1824, 278 vessels passed through the canal, but the expenses of maintaining the canal were considerable. Nearly 200 workmen were employed on the works, and the tonnage duty consequently doubled. The canal dues previous to the increase, from the year quoted above, amounted to £1555. Notwithstanding the increase the profits of the canal were small—more workmen were obliged to be employed. The increase tonnage drove the shipmasters to the circuitous passage of the Pentland Frith, though even now the duty on the whole passage was but 2s. 7d per ton. One of the reasons for increasing the duty was the complaint of the proprietors of the Forth and Clyde Canal, who complained that the Caledonian, constructed at the public expense, entered into an unfair competition with them by low terms.

Since that time no efforts have been able to make it a profitable one, though the Caledonian Canal, taking the circumstances of the time in which it was constructed into consideration, is a work of which the nation may be justly proud.

The mounds, which guard the entrance of the canal at the Beauley Frith, were advanced from the high water mark to 4 fathoms deep of water; at the end is the sea lock. These immense works are 400 yards long, and took four years to construct. The settling of the vast bottom of mud and earth took two years; and the cradle of masonary which surmounts it, capable of receiving the largest merchant ships, is 170 feet long, 40 feet wide, and 30 feet deep. The other works throughout the canal are on a similar scale. At the entrance of the lakes, owing to the sponginess of the ground, great difficulties were surmounted by the perseverance of the engineer. The dreging necessary for excavation of such an extent

was constrncted with immense ingenuity. Neptune's staircase, which we have already mentioned as connecting eight locks in succession, contains 400 yards of solid masonary. A construction of the kind had never been attempted before.

On the whole, few works show more vividly the untiring ingenuity and perseverance of the country than the Caledonian Canal—*Daily News.*

Improvements in rolling Iron.

[Specifications of patent granted to Mr. Wm. Clay, engineer, Clifton lodge, Cumberland, for certain improvements in machinery for rolling iron or other metals; parts of which improvements are applicable to other machinery, in which cylinders or rollers are used.]

This invention has for its object to roll bars of iron, or other metal, into a tapering form of a wedge like, or conical shape, and is caused by allowing the distance between the compression rollers to increase gradually and progressively as the rolling goes on.

1. The arrangement for carrying this invention into effect, consists in making the bearings of the top compression roller moveable, instead of stationary, so that they may slide up and down in their standars. Upon the top of this moveable rollers bears the lower end of a vertical rod, furnished with a piston at the upper end, which passes through a water and air tight stuffing box, into the bottom of a cylinder. This cylinder is filled with water, or other non elastic liquid, and is provided on either side with inflow and outflow valves. The rate of outflow of water from the cylinder is capable of being regulated to the greatest nicety by means of a screw spindle, to the end of which the outflow valve is attached, so that as the liquid runs away, the piston yielding to the presure of the bar cylinder, and, consequently allow tne top roller to slide upwards in its bearings, whereby the distance between the two rollers will be gradually and progressively increased, and the desired taper given to the bar, the shape of which will dopend upon that of the grooves. The top of the cylinder is provided with a safety valve, loaded (by means of a spring) to a certain extent, so that in case the presure should increase beyond it, the valve may open and allow the water to escape, and the piston to rise up to the top. The water is supplied from any convenient source, and the outflow valve is kept closed, when the machine is not at work, by a coiled spring placed behind it, upon the spindle. It is proposed to apply the safety valve arrangement to sugar cane crushing, and other mills, in order to obviate the injurious effects of sudden shocks.

2. A modification of the preceding consists in substituting for the hydraulic apparatus a sliding frame which rests on the top of the vertical piston rod. Above this frame works an eccentric, or heart shaped cam, keyed upon a shaft, so that as it revolves, the sliding frame will slide upwards, and allow of the top compression roller doing the same. Rotary motion is communicated to the cam shaft from the bottom roller through the intervention of toothed gearing.

When it is desired to roll one portion of a bar tapering, and the remainder parallel, the piston rod is made to pass through a screw, capable of being adjusted to any convenient distance to the top of the upper compression roller, and which catches against it, and thereby prevents its further upward motion.

Claims.—1. The application to rolling machinery in general (when such is required) of apparatus by which the bearings of one of the compression rollers are allowed to rise gradually in their standards to allow of taper forms being produced with the same facility as paralel bars.—2. The construction, or arrangement and adaption, of the hydraulic apparatus and appendages to machines for rolling iron and other metals, by which the shaping rollers are separated, so as to produce taper rod or bars by the rolling process.—3. The modification of the preceeding, which consists in the employment of the eccentric, or heart shaped cam, to regulate the gradual progresive separation of the rollers for the before stated purpose.—4. The adjustible screw in combination of the apparatus, claimed under the second and third heads for rolling bars, tapering for a portion of their length, and parallel for the remaining part thereof.—*Mining Jonr.*

English Patents.

IMPROVEMENTS IN STEAM-ENGINES.

[Specification of patent granted to Mr. John Penn, engineer, Greenwich, for certaln improvements in steam-engines.]

Mr. Penn's improvements in steam-engines are as follow:—1. He places a floater in tne condenser, or in a separate vessel suitably connected therewith, which, as the water accumulates in it, from accidental or other causes, ascends proportionally. This floater is connected to a stop-valve placed in the injection passage. The result of this arrangement is, that as the water accumulates in the condenser, and the floater consequently ascends, the stop-valve will be partially or wholly closed, and the influx of the injection prevented.—2. It is proposed to place in the steam passage leading from the boiler to the cylindery a suspendent ballance vessel, which is connected to a stop-valve placed a little further on in the same passage, in order that, as the boiler primes or the water boils over, a portion may be received into this vessel, which will descent by its increased gravity, and act upon the stop-valve, so as to partially or wholly close the passage of the steam to the cylinders, whereby the engines will be made to work at slow rate, and any injurious effects from sudden shocks to them be prevented.—3. A chamber, opened laterly to the water, is placed in the side of any auxiliary steam-vessel beneath the water-line, and is fitted with a small submerged horizontal paddle-wheel, whicn is keyed upon a vertical rod carrying a bevil wheel at top. This bevil wheel gears into another bevil wheel keyed upon the end of a horizontal cranked rod, fitted with a connecting rod, which works a double pair of weighted bellows, similar to those employed by blacksmiths. The top of these bellows is connected by a combination of cams, jointed rods, and levers, to the expansion valves, or throttle valves, or dampers, so that as the speed of the vessel through the water increases, the velocity of the revolution of the small paddle-wheel will increase also, and a greater quantity of air be driven into the top part of the bellows, which will consequently rise, and have the effect of regulating the passage of the steam to the cylinders, or the draught through the furnace. The bellows are provided with valves for regulating the quantity of air contained therein.

Claims—1. The application in marine steam-engines of a floater to tne condenser, or separate vessel separately connected thereto, and also of a stop valve to the condenser or injection pipe: the two being so connected together that, as the water accumulates in the condenser, from accidental or other causes, the flow of the injection water thereto will be partially or wholly stayed until the air pumps shall have reduced the water to its proper and determined level.—2. The application in marine steam engines of a suspended balanced vessel to the steam passage leading from the boiler to the steam cylinders, and also of a stop valve a little further on in the same passage; the two being so connected together that, as the priming or boiling over takes place, the passage of steam to the cylinders shall be partially or wholly closed, and the speed of the engine reduced accordingly.—3. The application of the self acting mechanical apparatus to sailing vessels propelled by auxiliary steam power, through the medium of screws or other suitable propellors, and which apparatus is made to work inversley to the speed of the vessel—that is to say, that as the speed of the vessel increases from the sailing power, the steam power shall be reduced accordingly' or *vice versa*, by means of this apparatus acting upon the expansion valves or throttle valves of the induction passages, or the dampers of the furnace.—*Ib.*

Proceedings of Scientific Societies in Great Britain.

INSTITUTION OF CIVIL ENGINEERS.

June 5.—JOSHUA FIELD, Esq., President, in the Chair.

The paper read was a "*Description of a Method of Rolling Bars for Suspension Bridges, and other like purposes.*" By Mr. THOMAS HOWARD, A. Inst. C. E.

It was described that by the ordinary process of manufacture, the head, or end of the link, out of which the eye, or hole for the connnecting pin, was bored, had been sometimes welded on to a parallel rolled bar, or, at other times, been hammered to the required form; both these methods were, however, objectionable, owing, in the former case, to the insecurity, and in the latter to the tediousness and expense. By the method introduced by Mr. Howard, the bars were rolled at once into the requisite form; the shingle, or faggot, was first passed longitudinally, at a welding heat, through grooved rollers, in the ordinary manner, and then, before being drawn down to the intended thickness, was carried to rollers having bosses, or increased diameters at the places corresponding to the heads to be produced, and there passed to and fro between the rollers transversly, or across the breadth of the bar; thus receiving a pressure only at the enlarged parts of the rollers, which gave the necessay increase of breadth at the heads; it was then taken to plain finishing rollers, and drawn out longitudinally in the usual

manner, until it attained the required length and thickness, the heads being afterwards trimmed by machinery to the exact deminsions, and the holes drilled for the pins.

It was stated that the chains of the large suspension bridge, erected by Mr. W. Tierney Clerke over the Danube, at Peeth, which lately so satisfactorily withstood the heavy strain brought upon it by a retreating army, were on this system at the King and Queen Ironworks at Rotherhithe: as were those for lifting the tubular bridge at Conway, and over the Menai Straits; and also that the links for a bridge now erecting by Mr. Vignoles, at Kieff, in Russia, were manufactured by another firm, under license to use Mr. Howard's system.

Some interesting observations were recorded of the results of the experiments for determining the strength of these bars, showing them to possess great elasticity and freedom from permanent set.

The discussion elicited some useful remarks as to proportions of the area of the body and of the head, and of the diameter of the pin, which, it was shown, had much influence on the resisting power of the heads;—the larger the pin the less being the tendency to rupture the eye.

The process appeared to be admitted as a great improvement on the ordinary mode of manufacture, and tending to give confidence to the engineer that his designs could be executed in metal, uninjured by manipulation.

June 12.—The first paper read was "*A Description of the Construction of a Collar Roof, with arched trusses of bent timber, at East Horsely Park.*" By the Right Honorable the Earl of Lovelace, A. Inst. C.E.

The roof which covered a hall of fifty six feet long by twenty four feet wide, was described as being sustained by four arched trusses, springing from stone corbels. The ribs of these were each composed of four layers of deals, three inches thick, bent to the required form by steam heat. All the mouldings surrounding the tracery were also bent to the required forms in the same manner, thus giving great strength and lightness, as well as performing the work with greater economy of labor. The tracery was cut out from two thicknesses, half an inch each, of tub stave oak, glued together, with the fibres at right angles to each other, which facilitated the carving, and gave greater strength to the minute tracery.

The ceiling was formed of half inch diagonal boarding, and as the slate battens crossed it in a horizontal direction, the roof was strongly braced against the action of the wind, and the staining of the alternate boards gave a pleasing variety of effect.

This kind of construction was first suggested by Colonel Emy, in his work on Carpentry, but he had applied it to much flatter roofs of large span, whereas Lovelace's intention was to demonstrate its applicability to roofs for edifices in the Pointed and Tudor styles, and to show that great advantage would result from bending timbers rather than cutting them to the requisite forms, that the thrust of the roof might be entirely taken from the upper part of the walls, and carried far down them and that such a construction might be adopted as would satisfy every conditon of solidity, and, at the same time, admit of considerable decoration.

In the discussion which ensued, the ingenuity of the design and of the mode of execution of the roof were equally approved, and the noble Earl was deservedly complimented for the motives which induced him to bring to the Institution the account of one of his works.

The second paper was "*A Statement of Observations made on the Initial and Terminal Velocities of Trains in descending Inclined Plains.*" By Capt. W. Moorsom, M. Inst. C.E.

The observations were eighty two in number, and were made during the ordinary passing of trains on the Waterford and Kilkenny Railway, the gauge of which is 5 ft. 3 in., over two adjoining inclines; falling at the rate of 1 in 100 for upwards of a mile and half, with a short intermediate level between them.

The speeds at whieh the descent was begun, varied from 20 to nearly 44 miles per hour, and the loads varied from 32 to 94 tons

One of the planes presented for the greater part of its length two curves of a radius of 1¼ and 1·6 miles respectively, and the other plane was straight for part of its length, but contained a curve of 2½ miles radius.

The general results in the more curved plane were, that initial velocities of 20 to 30 miles per honr, at the top of the plane, became terminal at velocities of 24 to 28 miles per hour; and on the straighter plane the same initial velocities became terminal between 29 and 31 miles per hour.

Again, on the more curved plane, initial velocities between 30 and 40 miles per hour, became terminal at velocities between 29 3-4 and 31½ miles per hour; and on the straighter plane the same initial velocities became terminal at 30 3 4 to 33 1-2 miles per hour.

Initial velocities above 40 miles per hour were noted only upon the more curved plane, and became terminal at 30 to 31 miles per hour. There did not appear to be any constant proportion between the load in motion and the terminal velocity; but the latter appeared to be dependant more upon initial velocity than upon the weight or character of frontage upon the trains·

The general practical conclusion was deduced, that the question of gauge had little or nothing to do with terminal velocity derived from gravity, and that the views generally entertained by engineers during past years, of the great resistances experienced by trains at high velocities were borne out by the observations recorded in the paper.—*C.E. & A. Journal.*

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These *Ropes* are now in successful operation on the planes of the Portage railroad in Pennsylvania, on the Publie Slips, on Ferries, and in Mines. The first rope put upon Plane No. 3, Portage railroad, has now run four seasons, and is still in good condition.

Iron.

THE Works of the New Jersey Iron Company at Boonton, N. J., having been recently enlarged and put in good repair, the company are prepared to receive orders for Iron, which will be executed with dispatch; and they warrant their iron equal in quality and finish to any in this country.

½ Round and square, to 6 inches,
½ Flat 4 "
Ovals, half-ovals and half-round.
Hoop, band and scroll iron.
Nail plates, superior charcoal Horse shoe,
Iron, sheet and Boiler iron,
Tire iron for locomotives,
Railroad spikes.
Pig iron of superior quality for chilling,
do, for foundry purposes.

For sale by JOHN F. MACKIE,
85 & 87 Broad Street,
Sole agent for the New Jersey Iron Co,

June 9, 1849.

Railroad Iron.

THE UNDERSIGNED ARE PREPARED TO contract for the delivery of English Railroad Iron of favorite brands, during the Spring. They also receive orders for the importation of Pig, Bar, Sheet, etc. Iron. THOMAS B. SANDS & CO.,
22 South William street,
February 3, 1849. New York.

Railroad Iron.

THE SUBSCRIBERS ARE PREPARED TO take orders for Railroad Iron to be made at their Phœnix Iron Works, situated on the Schuylkill River, near this city, and at their Safe Harbor Iron Works, situated in Lancaster County, on the Susquehannah river; which two establishments are now turning out upwards of 1800 tons of finished rails per month.

Companies desirous of contracting will be promptly supplied with rails of any required pattern, and of the very best quality.

REEVES, BUCK & CO.,
45 North Water St., Philadelphia.

March 15, 1849.

Railroad Iron.

THE Undersigned offer for sale 3000 Tons Railroad Iron at a fixed price, to be made of any required ordinary section, and of approved stamp.

They are generally prepared to contract for the delivery of Railroad Iron, Pig, Bar and Sheet Iron—or to take orders for the same—all of favorite brands, and on the usual terms. ILLIUS & MAKIN.
41 Broad street.

March 29, 1849. 3m.13

American Pig, Bloom and Boiler Iron.

HENRY THOMPSON & SON,
No 57 South Gay St., Baltimore, Md.,

Offer for sale, *Hot Blast* Charcoal *Pig Iron* made at the *Catoctin* (Maryland), and *Taylor* (Virginia), *Furnaces; Cold Blast* Charcoal Pig Iron from the *Cloverdale* and *Catawba*, Va., Furnaces, suitable for *Wheels* or *Machinery* requiring *extra* strength; also *Boiler* and *Flue Iron* from the mills of Edge & Hilles in Delaware, and *best quality Boiler Blooms* made from *Cold Blast Pig Iron* at the *Shenandoah Works*, Va. The productions of the above establishments can always be had at the lowest market prices for approved paper.

American Pig Iron of other brands, and *Rolled* and *Hammered Bar Iron* furnished at lowest prices. Agents for *Watson's Perth Amboy Fire Bricks*, and Rich & Cos. New York Salamander Iron Chests.

Baltimore, June 14, 1849. 6 mos

Iron Wire.

REFINED IRON WIRE OF ALL KINDS, Card, Reed, Cotton-flyer, Annealed, Broom, Buckle, and Spring Wire. Also all kinds of Round, Flat or Oval Wire, best adapted to various machine purposes, annealed and tempered, straightened and cut any length, manufactured and sold by

ICHABOD WASHBURN.

Worcester, Mass., May 25, 1849.

American and Foreign Iron.

FOR SALE,

300	Tons	A 1, Iron Dale Foundry Iron.
100	"	1, " " "
100	"	2, " " "
100	"	" Forge "
400	"	Wilkesbarre " "
100	"	"Roaring Run" Foundry Iron.
300	"	Fort " "
50	"	Catoctin " "
250	"	Chikiswalungo " "
50	"	"Columbia" "chilling" iron, a very superior article for car wheels.
75	"	"Columbia" refined boiler blooms.
30	"	1 x ½ Slit iron.
50	"	Best Penna. boiler iron.
50	"	"Puddled" "
50	"	Bagnall & Sons refined bar iron.
50	"	Common bar iron.

Locomotive and other boiler iron furnished to order.

GOODHUE & CO.,
64 South street.

New York.

PATENT HAMMERED RAILROAD, SHIP & BOAT SPIKES.—The Albany Iron Works have always on hand, of their own manufacture, a large assortment of Railroad, Ship and Boat Spikes from 2 to 12 inches in length, and of any form of head From the excellence of the material always used in their manufacture, and their very general use for rail roads and other purposes in this country, the manufacturers have no hesitation in warranting them fully equal to the best spikes in market, both as to quality and appearance. All orders addressed to the subscribers at the works will be promptly executed.

JOHN F. WINSLOW, *Agent.*
Albany Iron and Nail Works, Troy, N. Y.

The above Spikes may be had at factory prices, of Erastus Corning & Co Albany; Merritt & Co., New York; E. Pratt & Brother, Baltimore, Md.

LAP—WELDED WROUGHT IRON TUBES FOR TUBULAR BOILERS,

FROM 1 1-2 TO 8 INCHES DIAMETER.

These are the ONLY Tubes of the same quality and manufacture as those so extensively used in England, Scotland, France and Germany, for Locomotive, Marine and other Steam Engine Boilers

THOMAS PROSSER,
Patentee.
28 Platt street, New York.

Roman Cement,

OF the best quality, now landing from ship Hendrick Hudson, from London, made by Billingsley, Mial & Co., and superior to anything of the kind manufactured in England. For sale by G. T. SNOW,
109 Water Street, New York.

Large Wooden Pumps.

SEVERAL Large Wooden Square Pumps, of various sizes from 6 to 24 inches, and lengths from 10 to 25 feet, strongly bolted and strapped together with wrought iron; and used to great advantage on the Boston Water works; also two screw pumps each 25 feet long and 2½ feet in diameter, are now for sale by the Boston Water Commissioners.

For further particulars inquire at No. 119 Washington Street, Boston, or of E. S. CHESBROUGH, West Newton.

June 8, 1849.

P. S. DEVLAN & CO's Patent Lubricating Oil.

THE Subscribers invite the attention of Railroads, Steamboats, Machinists, etc., to the above article of Oil; they are prepared to supply it in any quantity. Certificates of its superiority over all other oils, from several of the largest Works and Railroads, can be seen at our office. KENNEDY & GELSTON,
5½ Pine street, New York,
Sole Agents for the New England States and State of New York. 1y14

TO RAILROAD COMPANIES AND MANUfacturers of Railroad Machinery. The subscribers have for sale American and English Bar Iron, of all sizes; English Blister, Cast, Shear and Spring Steel; Juniata Rods; Car Axles, made of double refined iron; Sheet and Boiler Iron, cut to pattern; Tires for Locomotive Engines, and other railroad carriage wheels, made from common and double refined B. O. Iron; the latter a very superior article. The Tires are made by Messrs. Baldwin and Whitney, Locomotive Engine Manufacturers of this city. Orders addressed to them, or to us, will be promptly executed.

When the exact diameter of the wheel is stated in the order, a fit to those wheels is guaranteed, saving to the purchaser the expense of turning them out inside.

THOMAS & EDMUND GEORGE,
a45 N. E. cor. 12th and Market sts., Philad., Pa.

To Railroad Companies and Contractors.

FOR SALE.—Two Locomotive Engines and Tenders, at present in use on the Beaver Meadow Railroad, being too light for their coal trains, but well calculated for either gravel or light passenger trains.

They weigh, in running order, about 8 tons each—having one pair of driving wheels 4 feet diameter, 4 truck wheels 30 inches diameter, with cylinders 10 in. diameter, and 18 inches stroke of piston. Tenders on 4 wheels. Address JAMES ROWLAND,
Prest. Beaver Meadow Railroad & Coal Co., Philadelphia.
or, L. CHAMBERLAIN, Sec'y, at Beaver Meadow, Pa.
May 19, 1849. 20tf

India-rubber for Railroad Cos.

RUBBER SPRINGS—*Bearing and Buffer—Fuller's Patent—Hose* from 1 to 12 inches diameter. Suction Hose. *Steam Packing*—from 1-16 to 2 in. thick. *Rubber and Gutta Percha Bands.* These articles are all warranted to give satisfaction, made under Tyer & Helm's patent, issued January, 1849.—No lead used in the composition. Will stand much higher heat than that called "Goodyear's," and is in all respects better than any in use. Proprietors of railroads do not be overcharged by pretenders.

HORACE H. DAY,
Warehouse 23 Courtlandt street.
New York, May 21, 1849.

NICOLL'S PATENT SAFETY SWITCH FOR Railroad Turnouts. This invention for some time in successful operation on one of the principal railroads in the country, effectually prevents engines and their trains from running off the track at a switch, left wrong by accident or design. It acts independently of the main track rails; being laid down or removed without cutting or displacing them.

It is never touched by passing trains, except when in use, preventing their running off the track. It is simple in its construction and operation, requiring only two castings and two rails; the latter, even if much worn or used, not objectionable.

Working models of the Safety Switch may be seen at Messrs. Davenport, Bridges & Kirk's Cambridge Port, Mass., and at the office of the Railroad Journal, New York.

Plans, Specifications, and all information obtained, on application to the Subscriber, Inventor and Patentee. G. A. NICOLLS,
Reading, Pa.

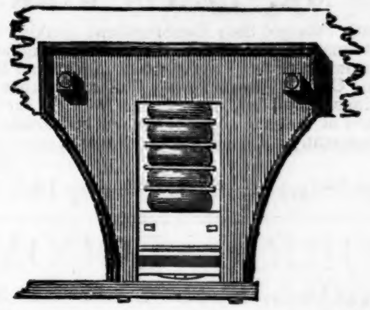
Large Pumps.

THE Boston Water Commissioners offer for sale a large number and variety of Wooden Square Pumps, used in clearing excavations from water during the construction of the Aqueducts.

Also Two Large Screw Pumps, each 25 feet long and 2½ feet in diameter.

For further particulars, enquire at the office of the Water Commissioners, 119 Washington St., Boston, or of E. S. Chesbrough, West Newton.
May 19, 1849. 6w20

Patent India-rubber Springs.



FULLER & CO. beg that parties interested in the use of these Springs will not be misled by ex-parte statements, but will examine the actual Patents and judge for themselves.

The statements made by Messrs. Crane & Ray shall be treated seriatim.

They claim to have first introduced India-rubber Springs about two years since, whereas they were used by Fuller & Co. nearly four yeas ago.

They claim the exclusive right to use Sprngs. They have no right whatever; every spring they make is an infringement upon Fuller's patent, dated 1845. They claim the sole right to make India rubber, and apparently think because a species of India-rubber was patented some years since, that no person can make any other now. A patent was *granted in January last* to Messrs. Tyer & Helm for a new and improved kind of Vulcanized rubber which is used by Fuller & Co.

Fuller's springs it is needless to say are in very general use, although Messrs. Crane & Ray pretend that they know of only one or two instances. Fuller & Co. guarantee all parties who use their springs.

As to the Legal proceedings—an action has been commenced against one company for an alleged infringement of Goodyear's patent, but is being defended with every prospect of success. An action has also been commenced by Fuller & Co., against parties for an infringement of Fuller's patent, and *this will be done in every case of violation.*

In every case in which Fuller's spring has been applied, it has been pronounced superior to that made by Mr. Ray, and this fact induces Messrs. Crane & Ray to claim the right of using it. They attempt to lead the public from the real question at issue, by producing a Deposition as to Mr. Ray having *tried to make* a spring which Mr. Fuller *did make* and patent. If Mr. Ray did invent a spring in 1844, why did he not apply for a patent, and not wait until 1848, when his application was rejected!

Mr. Knevitt has never stated that the springs were put on by him, which are refered to in Mr. Hale's article, but he does state that those springs are made according to Mr. Fuller's specification, and consequently are an infringement upon it. The article of Mr. Hale in the Boston Advertiser, quoted by Messrs Crane & Ray, was followed immediately by a letter in the same paper, from Mr. Knevitt, setting forth the facts of the case.

The springs refered to were put on by Mr. Ray before Mr. Knevitt came to the United States; when he arrived he gave Mr. Ray notice not to proceed further in making or vending such springs; Mr. Ray then said he did not wish to infringe, and would not continue to do so, and he then contrived an India-rubber and Air spring which totally failed.

In the selection of their first agent, Fuller & Co. were particularly unfortunate, and their reason for adverting to it is simply that it may tend to throw light on subsequent transactions, and furnish a reply to the remark, "that this opposition was invited by their own delay in getting the thing to work." The individual refered to undertook the agency for Fuller's springs, and left Liverpool on the 1st January, 1847, furnished with a complete set of drawings, models, etc., and every necessary instruction to make arrangements respecting the supply of material, and to have it at work within the time limited by law; but *from that hour to the present, not a single communication has been received from the said agent.* Some of their models, however, they have traced into the hands of parties now seeking to invade their rights, and by whom they understand they have been exhibited as specimens of their own invention.

The superiority of Fuller's spring is implied in the offer of the New England Car Co. to make springs upon his principle (now that a preference is given to the disc and plate form) and this notwithstanding the fact, that Fuller & Co. have a patent, and that Mr. Ray's application for one was rejected. The public can judge which company's course has been the most honorable, or whose statements are entitled to consideration.

Fuller's springs can be obtained of *Mr. Knevitt* the Agent, at 38 Broadway New York, and of *Messrs. James Lee & Co.*, 18 India Wharf, Boston.
May 26, 1849.

C. W, Bently & Co.,

PORTABLE Steam Engine and Boiler Manufacturers, East Falls Avenue, near Pratt St. Bridge, BALTIMORE, MARYLAND.

Their Engines are simple in their construction, compact and durable; they require no brick work in setting them, and occupyidg but a small space (a six horse power engine and boiler, standing on a cast iron plate of three by six feet.)

They also manufacture Major W. P. Williamson's new oscillating Engine; a superior article, combining cheapness and simplicity (one of which may be seen in operation at their shop.) Both of these engines are adapted to any purpose, where power is required, and may be made of any capacity; and for economy in use of fuel are unsurpassed.

All kinds of machinery made to order. Steam Generators, Force Pumps, Wrought Iron Pipes and Fillings for Steam, Water, Gas, etc., constantly on hand,
Baltimore, June 6, 1849.

PHILADELPHIA CAR MANUFACTORY,

CORNER SCHUYLKILL 2D AND HAMILTON STS.,
SPRING GARDEN, PHILADELPHIA CO., PA.

Kimball & Gorton,

Having recently constructed the above works, are prepared to construct at short notice all kinds of

RAILROAD CARS, Viz:

Passenger Cars of all classes—Open and Covered Freight and Express Cars—Coal Cars—Hand Cars & Trucks of all descriptions.

They are also prepared to furnish Chilled Wheels of any pattern. Car Wheels & Axles fitted and furnished. Snow Ploughs and Tenders made to order. Steel and other Springs always on hand.

All orders will be filled at short notice, and upon as good terms as at any other establishment in the country.

Omnibuses from the Exchange run within one square of the manufactory every 10 minutes during the day.
Philadelphia, June 16, 1849. 1y25

LAWRENCE'S ROSENDALE HYDRAULIC Cement. This Cement is warranted equal to any manufactured in this country, and has been pronounced superior to Francis' "Roman." Its value for Aqueducts, Locks, Bridges, Flooms, and all Masonry exposed to dampness, is well known, as it sets immediately under water, and increases in solidity for years.

For sale in lots to suit purchasers, in tight papered barrels, by JOHN W. LAWRENCE,
142 Front-street, New York.

☞ Orders for the above will be received and promptly attended to at this office. 32 1y.

Text Book of Mechanical Drawing,

FOR the use of SCHOOLS and SELF-INSTRUCTION, containing,

1st. A series of progressive practical problems in Geometry, with full explanations, couched in plain and simple terms; showing also the construction of the *parallel ruler, plane scales* and *protractor*.

2d. Examples for drawing *plans, sections* and *elevations* of Buildings and Machinery, the mode of drawing elevations from *circular* and *polygonal* plans, and the drawing of Roman and Grecian Mouldings.

3d. An introduction to *Isometrical drawing*, with 4 plates of examples.

4th. A treatise on *Linear Perspective*, with numerous examples and full explanations, rendering the study of the art easy and agreeable.

5th. Fxamples for the projection of shadows.

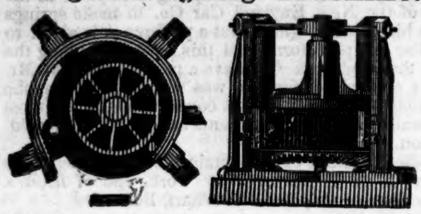
The whole illustrated with 50 STEEL PLATES.

Published by WM. MINIFIE & CO.,
114 Baltimore St., Baltimore, Md.

Price $3, to be had of all the principal booksellers.

MACHINERY.

Henry Burden's Patent Revolving Shingling Machine.



THE Subscriber having recently purchased the right of this machine for the United States, now offers to make transfers of the right to run said machine, or sell to those who may be desirous to purchase the right for one or more of the States.

This machine is now in successful operation in ten or twelve iron works in and about the vicinity of Pittsburgh, also at Phœnixville and Reading, Pa., Covington Iron Works, Md., Troy Rolling Mills, and Troy Iron and Nail Factory, Troy, N. Y., where it has given universal satisfaction.

Its advantages over the ordinary Forge Hammer are numerous: considerable saving in first cost; saving in power; the entire saving of shingler's, or hammersman's wages, as no attendance whatever is necessary, it being entirely self-acting; saving in time from the quantity of work done, as one machine is capable of working the iron from sixty puddling furnaces; saving of waste, as nothing but the scoria is thrown off, and that most effectually; saving of staffs, as none are used or required. The time required to furnish a bloom being only about six seconds, the scoria has no time to set, consequently is got rid of much easier than when allowed to congeal as under the hammer. The iron being discharged from the machine so hot, rolls better and is much easier on the rollers and machinery. The bars roll rounder, and are much better finished. The subscriber feels confident that persons who will examine for themselves the machinery in operation, will find it possesses more advantages than have been enumerated. For further particulars address the subscriber at Troy, N. Y. P. A. BURDEN.

Railroad Spikes and Wrought Iron Fastenings.

THE TROY IRON AND NAIL FACTORY, exclusive owner of all Henry Burden's Patented Machinery *for making Spikes*, have facilities for manufacturing large quantities upon short notice, and of a quality unsurpassed.

Wrought Iron Chairs, Clamps, Keys and Bolts for Railroad fastenings, also made to order. A full assortment of Ship and Boat Spikes always on hand.

All orders addressed to the Agent at the Factory will receive immediate attention.

P. A. BURDEN, *Agent*,
Troy Iron and Nail Factory, Troy, N. Y.

RAILROAD WHEELS.

CHILLED RAILROAD WHEELS.—THE UNdersigned are now prepared to manufacture their Improved Corrugated Car Wheels, or Wheels with any form of spokes or discs, by a new process which prevents all strain on the metal, such as is produced in all other chilled wheels, by the manner of casting and cooling. By this new method of manufacture, the hubs of all kinds of wheels may be made whole—that is, without dividing them into sections—thus rendering the expense of banding unnecessary; and the wheels subjected to this process will be much stronger than those of the same size and weight, when made in the ordinary way.

A. WHITNEY & SON,
Willow St., below 13th,
Philadelphia, Pa.

CHILLED RAILROAD WHEELS.—THE UNdersigned, the *Original Inventor* of the *Plate Wheel* with solid hub, is prepared to execute all orders for the same, promptly and faithfully, and solicits a share of the patronage for those kind of wheels which are now so much preferred, and which he originally produced after a large expenditure of time and money.

A. TIERS,
Point Pleasant Foundry.

He also offers to furnish Rolling Mill Castings, and other Mill Gearing, with promptness, having, he believes, the largest stock of such patterns to be found in the country. A. T.

Kensington, Philadelphia Co., }
March 12, 1848. }

ENGINE AND CAR WORKS.

DAVENPORT & BRIDGES,

HAVING ASSOCIATED WITH THEM

MR. LEWIS KIRK, OF READING, PA.,

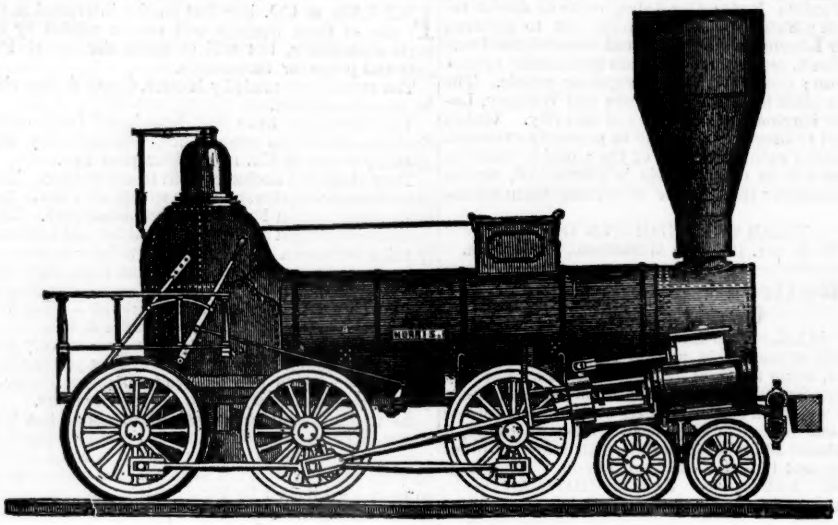
And recently enlarged their Establishment, (making it now the most extensive in the United States,) they are prepared to manufacture to order Locomotive Engines and Cars of every description. Stationary Engines, Steam Hammers, Boilers, and all kinds of Railroad Machinery. Also, Castings and Forge Irons of all kinds—including Chilled Wheels, Frogs, Chairs, Switches, Car Axles, and Locomotive Cranks, Connecting Rods, Steel Springs, Bolts, etc., etc. Orders from all parts of the country solicited for Engines and Cars, or any part or parts of the same. All orders will be furnished at short notice, and on as good terms as any manufactory in the country. Coaches pass our works every fifteen minutes during the day, from Brattle St., Boston.

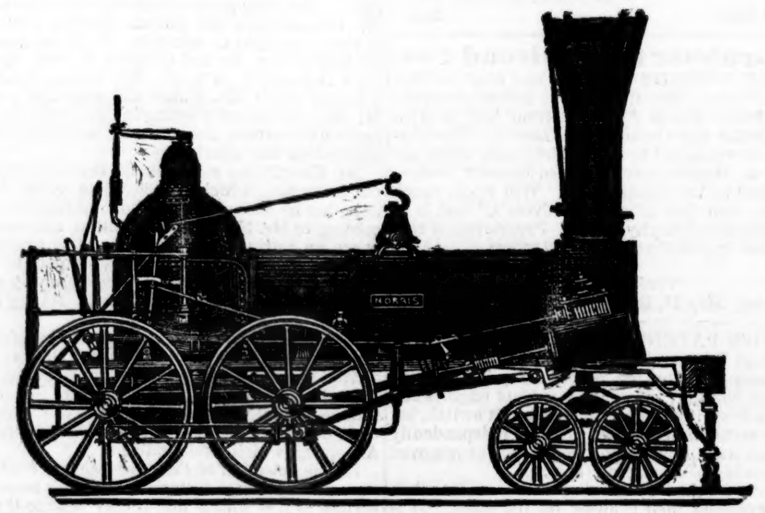
DAVENPORT, BRIDGES & KIRK.

Cambridgeport, Mass., February 16th, 1849.

NORRIS' LOCOMOTIVE WORKS.

BUSHHILL, SCHUYLKILL SIXTH-ST., PHILADELPHIA,





THE UNDERSIGNED Manufacture to order Locomotive Steam Engines of any plan or size.

Their shops being enlarged, and their arrangements considerably extended to facilitate the speedy execution of work in this branch, they can offer to Railway Companies unusual advantages for prompt delivery of Machinery of superior workmanship and finish.

Connected with the Locomotive business, they are also prepared to furnish, at short notice, Chilled Wheels for Cars of superior quality.

Wrought Iron Tyres made of any required size—the exact diameter of the Wheel Centre, being given, the Tires are made to fit on same without the necessity of turning out inside.

Iron and Brass castings, Axles, etc., fitted up complete with Trucks or otherwise.

NORRIS, BROTHERS.